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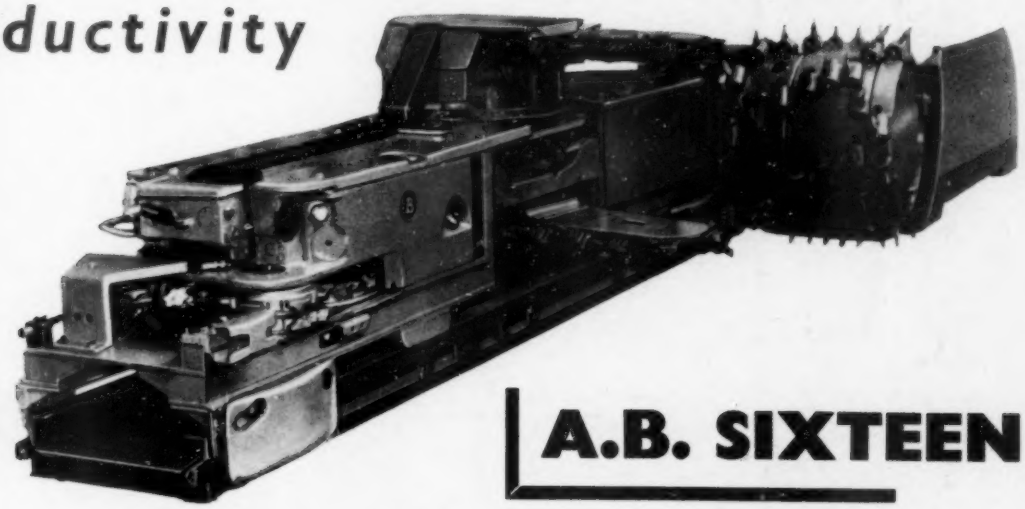
THE IRON AND COAL TRADES' REVIEW

Improve Coal sizing, Output and Productivity

WITH THE



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PRE-CUTTING

ANDERTON SHEARER-LOADER

Hydraulic Haulage with Auto Control. 100 or 125 h.p. continuously rated water-cooled motor.

Illustration shows version with HAULAGE END COMBINED OVERCUT AND UNDERCUT

Other arrangements available:

Undercut.
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HEAD OFFICE: FLEMINGTON ELECTRICAL WORKS, MOTHERWELL

London Office: 25 Victoria Street, S.W.1

Branches at Gateshead, Rotherham, Cardiff and Glenrothes (Fife).
Represented throughout the coalfields of the world.

4 STAND

TANDEM COLD STRIP MILL

This new Davy-United 10½″ and 26″ x 22″ 4-high 4-stand tandem cold strip mill rolls mild steel and high carbon strip from 4″ to 18″ wide at speeds up to 2,100 ft. per minute. The mill was installed in the Brinsworth plant of Steel, Peech & Tozer Branch of The United Steel Companies Limited.

Special Davy-United instrumentation on the mill consists of automatic gauge control on stands 1 and 4, loadmeters on all stands and automatic inter-stand tension control between stands 3 and 4.

DAVY-UNITED | DAVY-ASHMORE GROUP

DAVY AND UNITED ENGINEERING COMPANY LIMITED · SHEFFIELD

LONDON . STOCKTON . GLASGOW . MIDDLESBROUGH . HULL . PARIS . MONTREAL . MELBOURNE . SYDNEY . JOHANNESBURG . SALISBURY . CALCUTTA . BOMBAY

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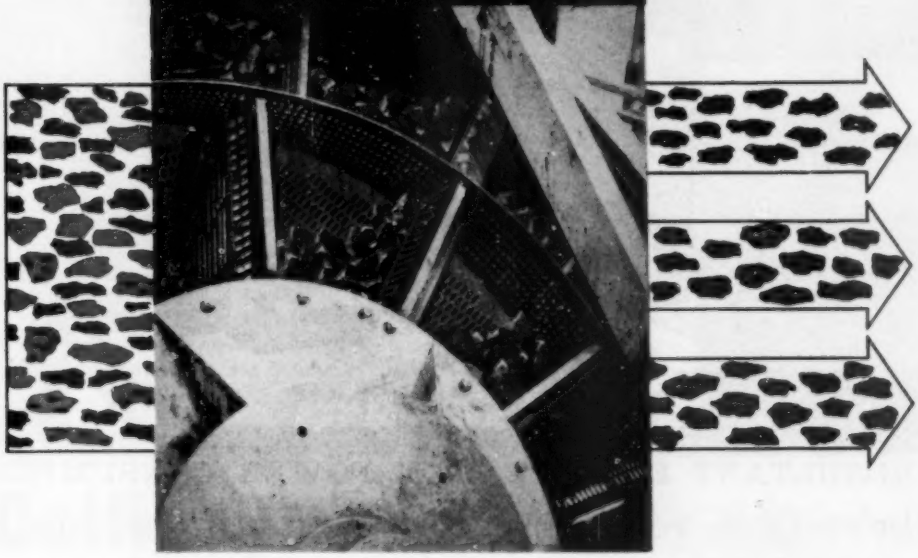
THREE FROM ONE



This new dense-medium three-product separator, designed and developed by Simon-Carves, segregates raw coal three ways, into clean coal, middlings and dirt. One Simon-Carves three-product separator does in one operation the work of two two-product separators working in series, thus saving plant space and overall capital cost.
All sizes from 10" down to 1/8" can be efficiently treated and accurate separations are made at any combination of separating densities between 1.30 and 1.90.

COAL PREPARATION PLANT BY

Simon-Carves Ltd

MEMBER COMPANY SIMON ENGINEERING LTD

CHEADLE HEATH · STOCKPORT · ENGLAND

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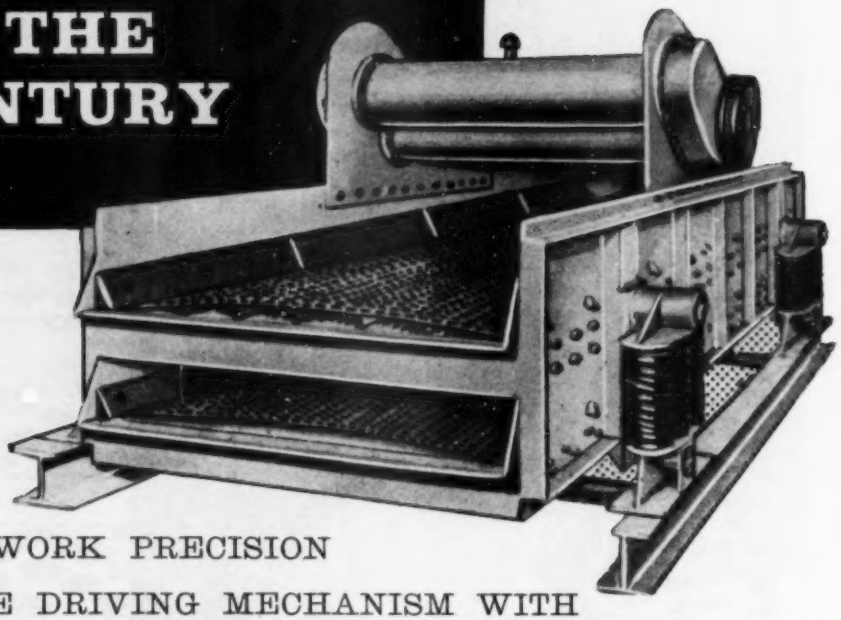
"LECCO-VIB" THE SCREEN OF THE CENTURY



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- UNIQUE DRIVING MECHANISM WITH RESULTANT **EXTREME** LOW POWER CONSUMPTION
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- MODELS FROM 3′ x 1′ 6″ to 24′ x 9′

MACHINES FOR HANDLING LARGE AND SMALL MATERIAL

DEVELOPED AND TESTED UNDER THE HAZARDOUS CONDITIONS OF THE IRON ORE INDUSTRY OF THE MESABI RANGE AND PROVEN TO BE WITHOUT EQUAL

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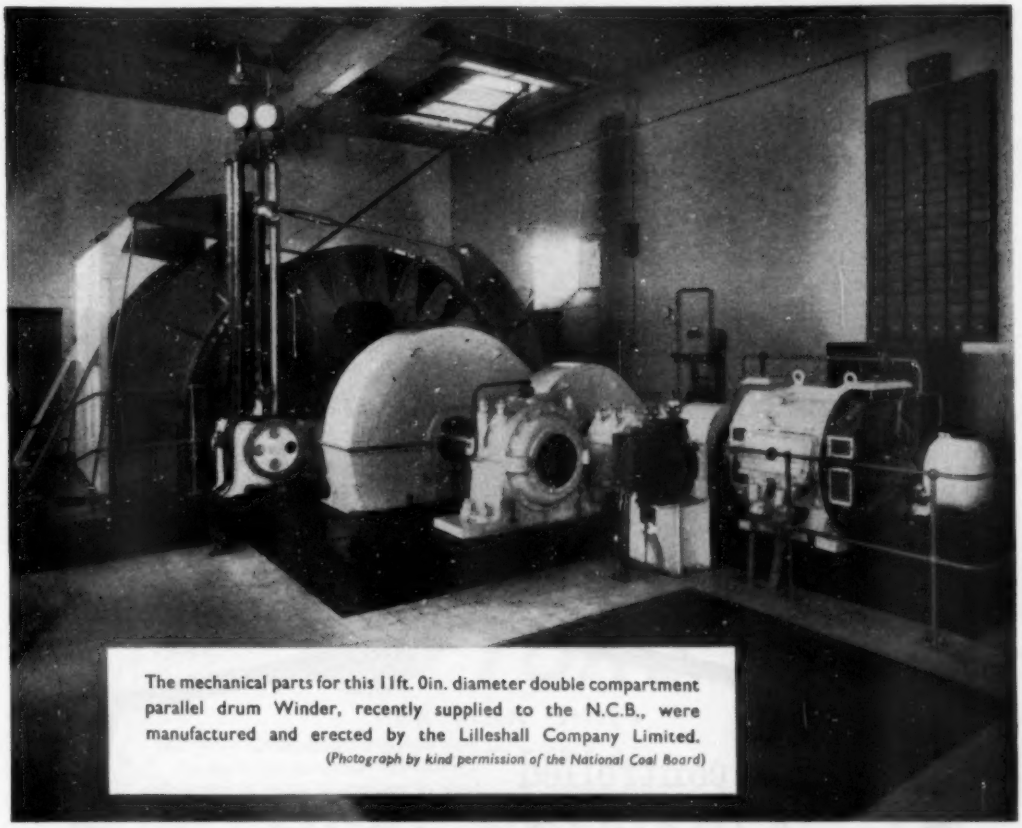
UNIFLOC LTD, SWANSEA, GREAT BRITAIN. TEL: 55164 (3 lines) GRAMS: UNIFLOC S. WALES

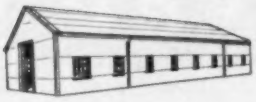


The mechanical parts for this 11ft. 0in. diameter double compartment parallel drum Winder, recently supplied to the N.C.B., were manufactured and erected by the Lilleshall Company Limited.
(Photograph by kind permission of the National Coal Board)

Colliery equipment by

Designers *and users* of Colliery equipment since the reign of George III, the Lilleshall Company have been privileged to supply Headgears, Winders, Surface Buildings, Steelwork and other equipment to some of the most modern Collieries in the country. Other Lilleshall products include all types of structural steelwork, prefabricated buildings, refractory and common bricks, precast concrete products, timber products, glazed sanitary ware, and mechanical engineering.

LILLESHALL



KARISCOL
The Lilleshall "Kariscol" prefabricated building system eliminates on-site welding, minimum site bolting permitting speedy erection.

THE LILLESHALL COMPANY LIMITED

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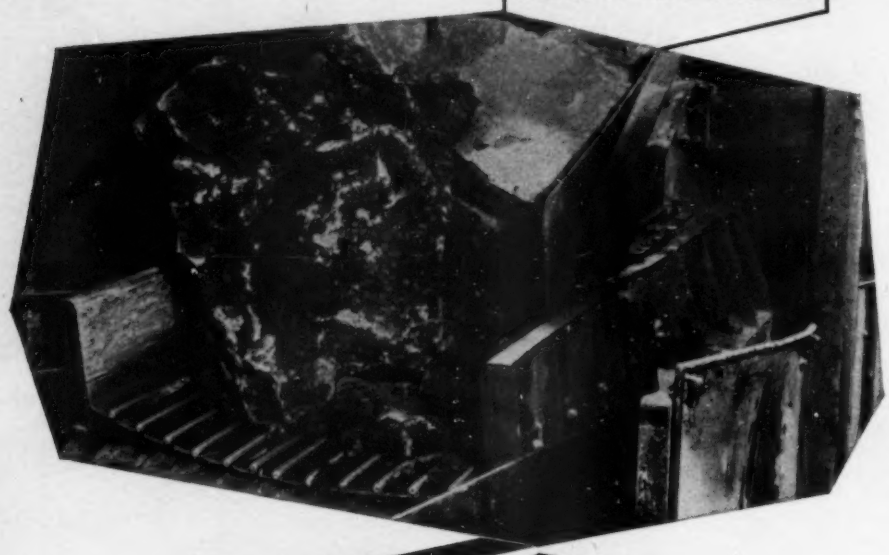
SPOTLIGHT ON BULK HANDLING EQUIPMENT

Sherwen Feeders



. . . for controlled feeding with minimum wear

Sherwen electromagnetic vibrating feeders are handling millions of tons of materials daily in numerous industries throughout the world.

These machines are ideally suited for run-of-mine or quarry sizes and effectively handle even the more abrasive materials at feed rates up to 1500 tons per hour.

The rate of flow is easily controlled and infinitely variable, and maintenance, because of the absence of moving parts, is negligible.

Efficient blenders, expertly-designed crushers, the world's largest range of screens and feeders—all are products of the skill, craftsmanship and experience of one of the world's largest engineering organisations.

rely on the experience of

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G.E.C. (ENGINEERING) LIMITED · GENERAL ENGINEERING DIVISION · ERITH · KENT

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IN THE FOUR WEEKS OF OCT., 1961
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OVER

5 TONS

PER MAN SHIFT
ALL EMPLOYED AT

LINBY COLLIERY

No. 6 AREA EAST MIDLANDS DIVISION

GENERAL RUN OF CABLE BELT ROPE DRIVEN CONVEYOR AT LINBY COLLIERY.
Photograph by permission of The National Coal Board East Midlands Division

The men at Linby can be proud of this achievement just as we are proud of the fact that all this output was transported from the coal face to pit bottom on two Cable Belt rope driven conveyors a distance of almost

4 miles

The longest conveyor is 10,000 feet in length with a 42 in. wide belt and has a single drive unit of 500 h.p.

Get up to date ... get a **CABLE BELT CONVEYOR**

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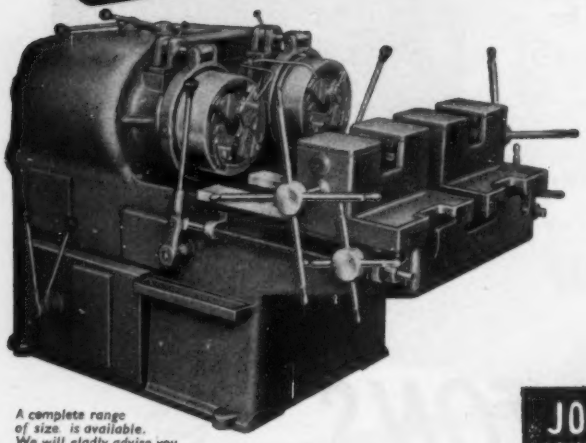
-double production

WITH

HEAP'S

2½" DOUBLE HEAD BOLT SCREWING MACHINES



Designed for really high output the HEAP'S Automatic 2½ in. Bolt Screwing Machines will cut either right or left hand threads (or both at the same time). The machine is fitted with our patent TANGENTIAL Die Heads, which open automatically when any predetermined length has been threaded. Capacity: Bolts up to 2¼ in. dia. pipes up to 2 in. dia. parallel or taper.

A complete range of size is available. We will gladly advise you as to the most suitable machine for your requirement. Catalogue free on request.

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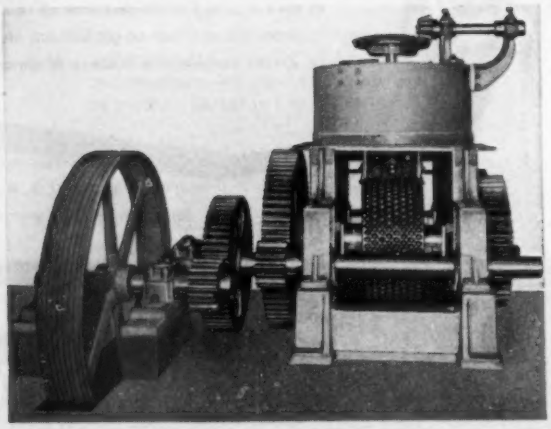
BRIQUETTE MACHINERY



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YOUR OWN MATERIALS TESTED FOR SUITABILITY FOR BRIQUETTING AT OUR OWN BRIQUETTE WORKS IN LEEDS.

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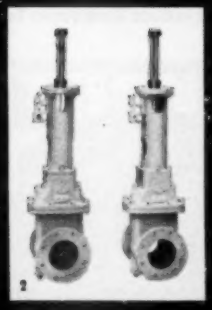

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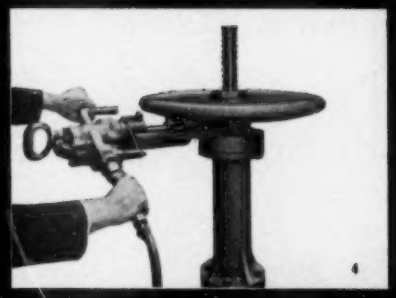

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A group of valves fitted with Rotork Actuators. Valves of this type have provision for manual operation in the event of a power failure.

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Two valves fitted with hydraulic cylinders. Pneumatic cylinder operation is also available.

3 Electrical Solenoid Operated
A valve fitted with a dust-proof pull-type solenoid. This valve is designed to close automatically in the event of a power failure.

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A valve arranged for air drill operation. This semi-automatic method of operation is particularly suitable where full mechanisation is not justified.

CONVERT YOUR EXISTING VALVES TO POWER OPERATION

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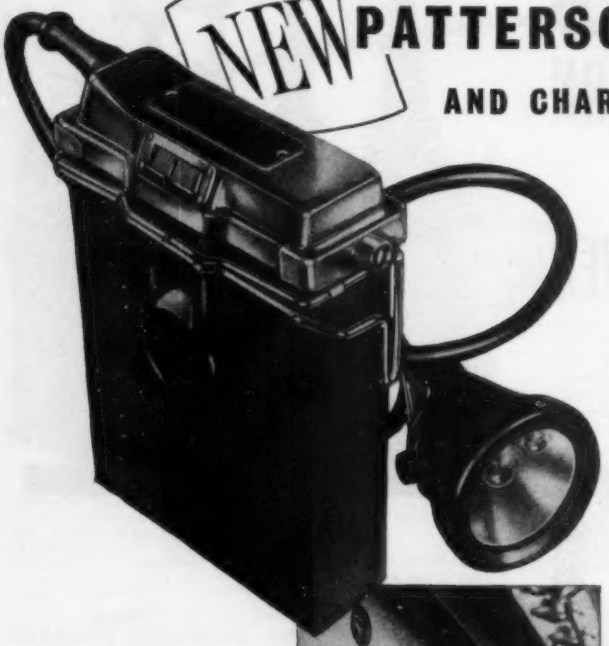
Better lamps—better lamprooms

WITH THE NEW

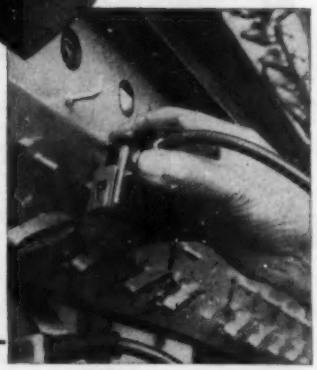
PATTERSON CAP LAMPS

AND CHARGING RACK

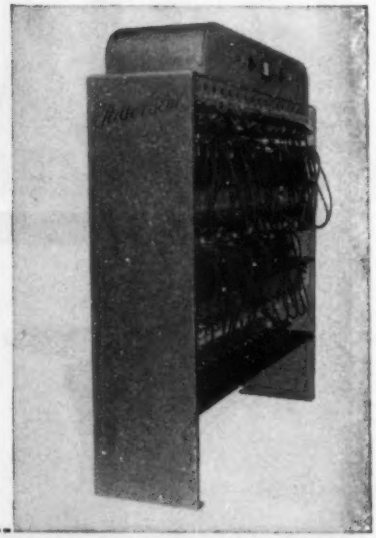


Improved light output and long trouble-free life are features of the new Patterson cap lamps. Fitted with high grade reflectors, silver tipped contacts, and Exide lead-acid batteries, they work brilliantly without a flicker.

They are automatically kept at the peak of efficiency by the attractive new Patterson charging rack. This is based on the headpiece key-type charging system and is designed to increase lamproom efficiency and reduce lamproom labour.



The type SS 3 self-servicing cap lamp and headpiece. It fits any standard headpiece key-type charging equipment or can be used with the new Patterson charging rack.



To: PATTERSON LAMPS (1953) LIMITED
1 Second Avenue, Team Valley, Gateshead-on-Tyne 11
Please send me further details of your new cap lamp and charging rack.

NAME_____

ADDRESS_____

PATTERSON LAMPS (1953) LIMITED

Makers of Miners' Lamps and Lamproom Equipment for over 70 years

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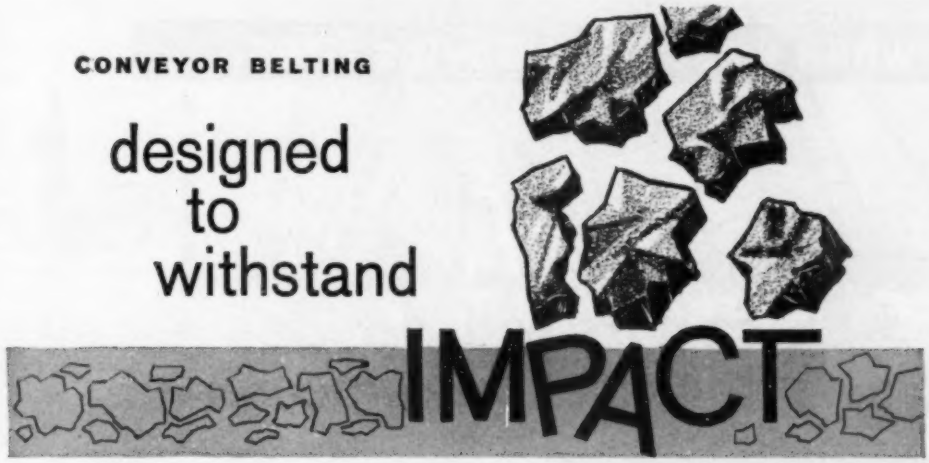
TGA P150a

CONVEYOR BELTING

designed to withstand IMPACT



Turners Cotton/Nylon and breaker strip belting has been developed for use where severe impact and abrasion is a problem. It is specially recommended for carrying dense metallic ores, granite, and other materials in lump form. Our latest conveyor belting catalogue gives full information on conveyor belting for all industries—send for your copy now, Ref: HSA.264/2.

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3 factors will decide the final outcome

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We make it! We manufacture a complete line of modern diamond drills—underground and surface models, compressed air, gasoline or diesel power. Capacities range from 200 to 5000 feet. We also manufacture hundreds of auxiliary items—everything from core splitters to 60-foot derricks. We are exclusive manufacturers of PERMASET diamond bits and reaming shells—available in all standard sizes and in a multitude of patterns developed to penetrate every known formation with speed, economy and maximum core recovery.

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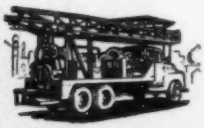

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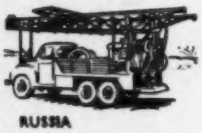

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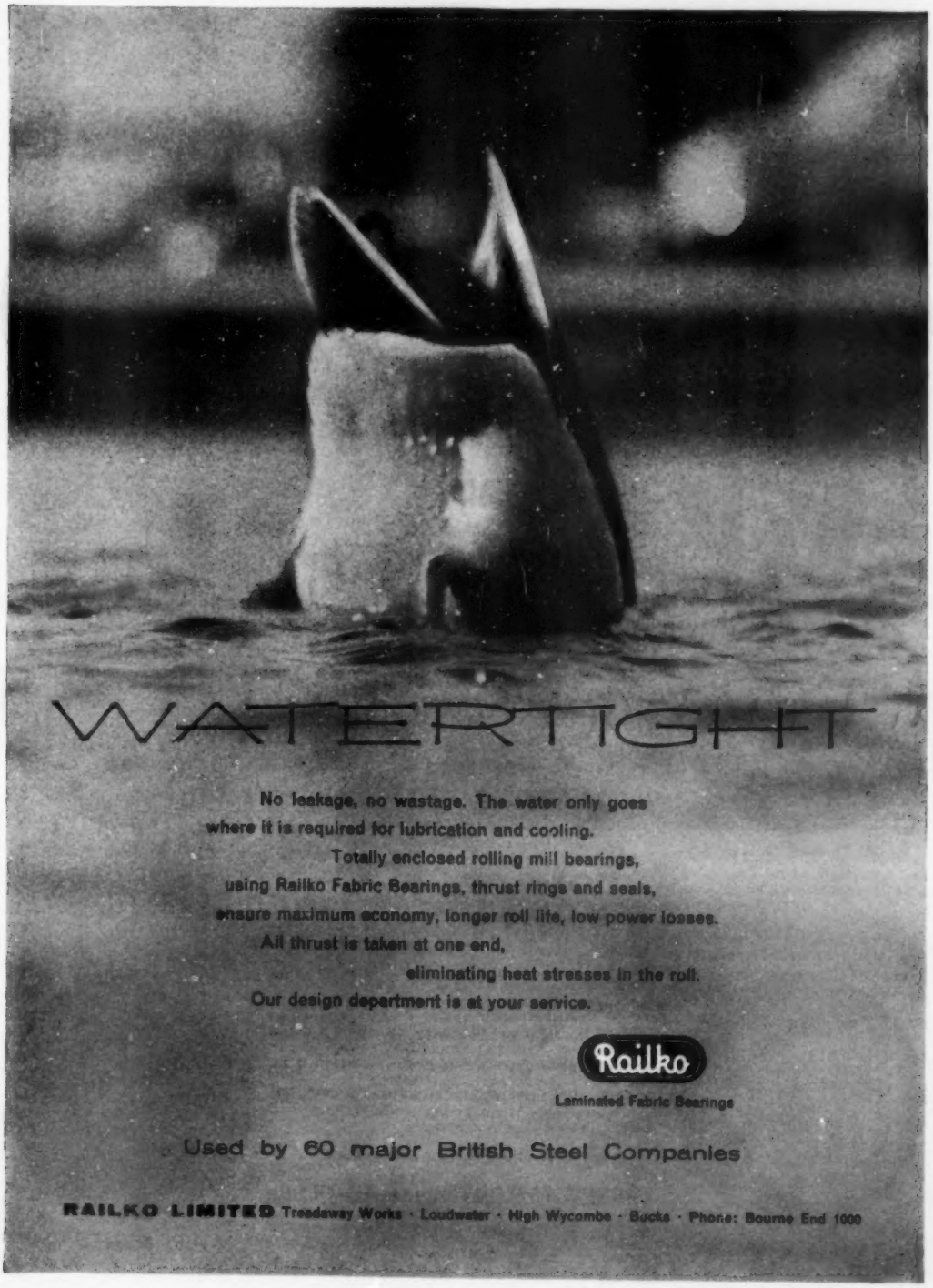
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Totally enclosed rolling mill bearings,
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Equipment

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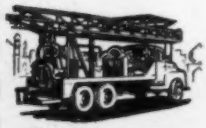

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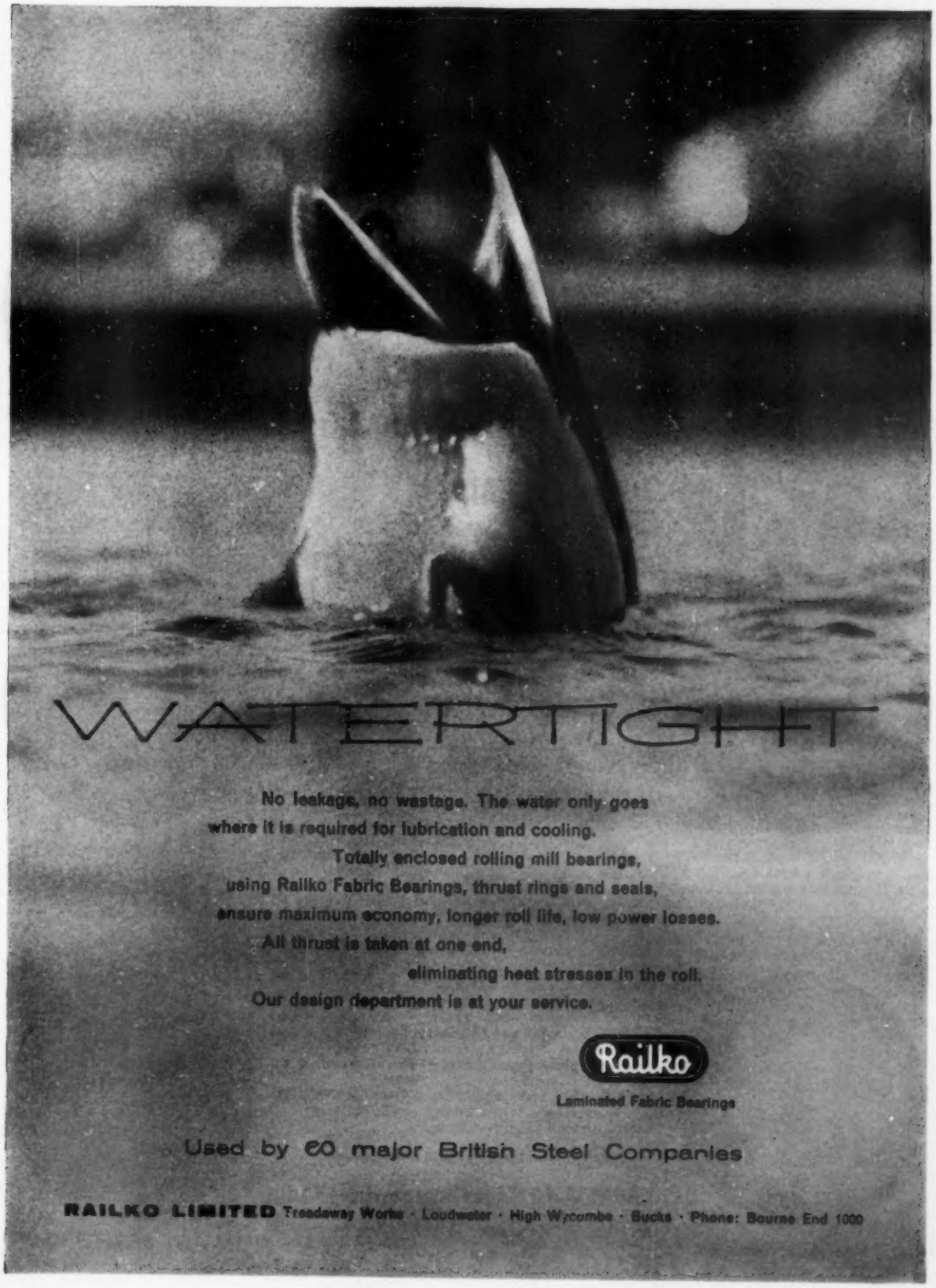
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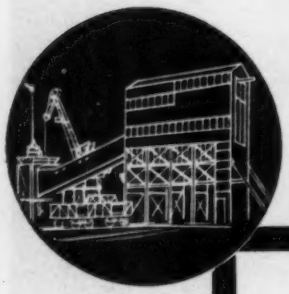

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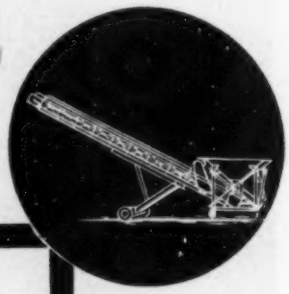
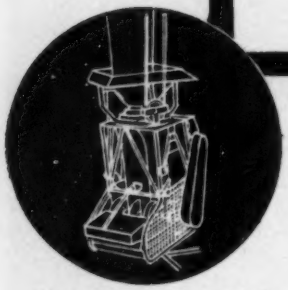
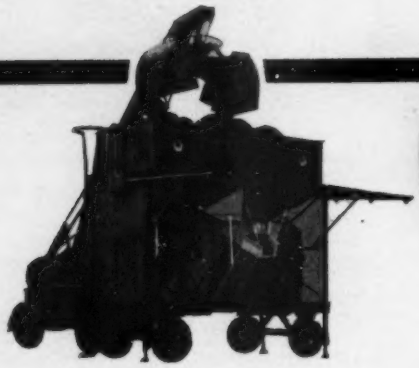


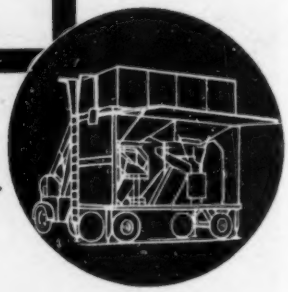
Beaver (Bulk Stacker)



Meteor Thrower (Suspended)



A Crone & Taylor Bagging Unit



Bagging Unit

Unit Conveyor (Overhead)

A standard twin unit, with a capacity from 18 to 24 tons per hour 8" coal, or 10 to 14 tons per hour coke. The machine offers maximum storage with minimum floor space. The platform, which is at lorry height, is enclosed for all weather protection.

For particulars of Bagging Units contact :

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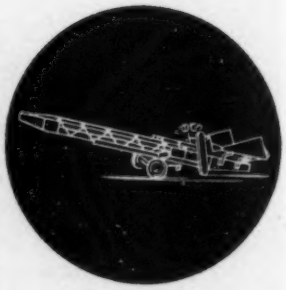
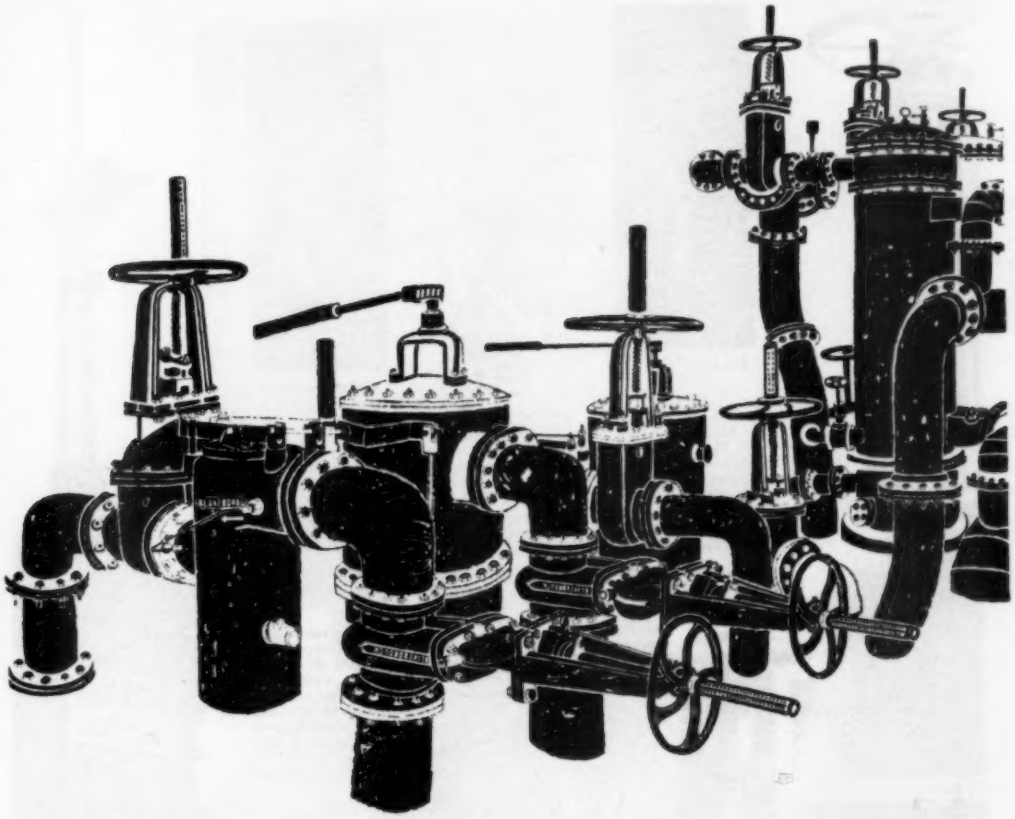
St. Helen's, Lancashire, England. Tel: St. Helens 3283/4/5.



Walrus Stacker



THE MONEY THAT MANAGEMENTS SAVE THROUGH MOBIL ECONOMY SERVICE

More than £1,360 saved in a year at J. Blakeborough & Sons Limited

TAKING POSITIVE ACTION to cut maintenance and lubrication costs, J. Blakeborough & Sons Ltd., world famous valve manufacturers, consulted the experts—Mobil. After accepting their recommendations, and applying the correct lubrication programme, Blakeborough found that they had made direct savings of over £1,360. Indirect savings were estimated at a further £2,100.

World-wide experience of industrial lubrication

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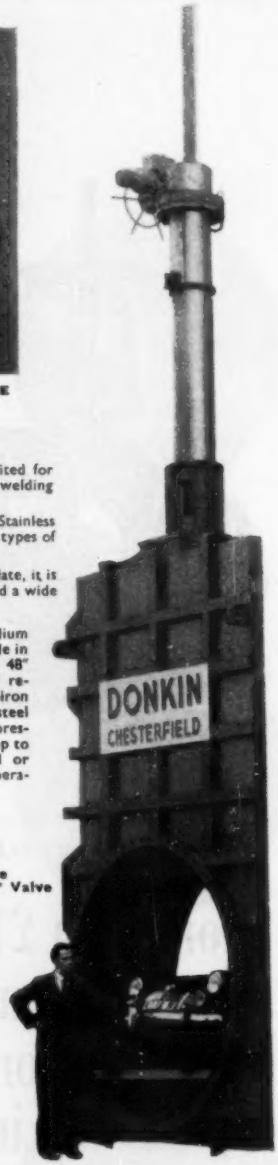

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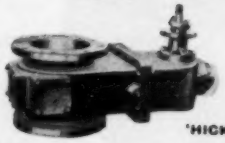

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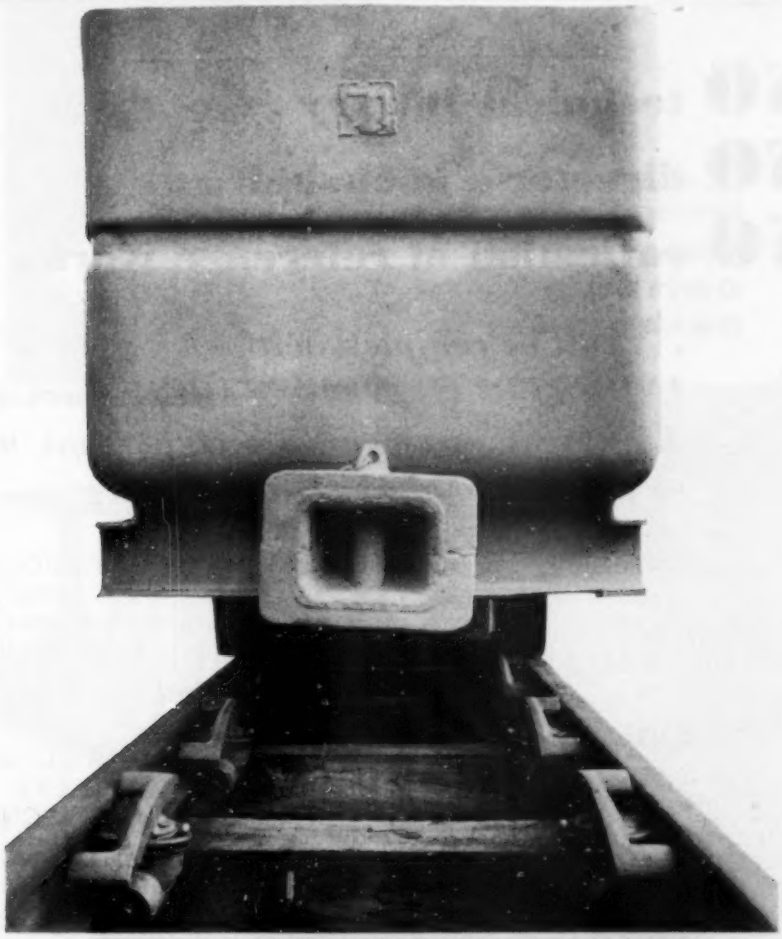

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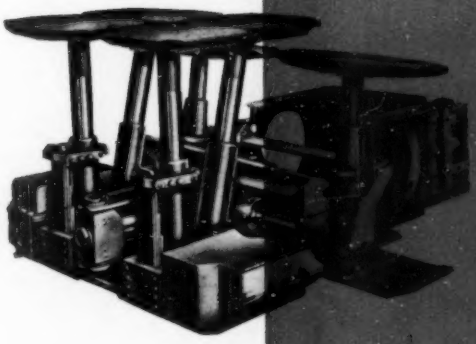

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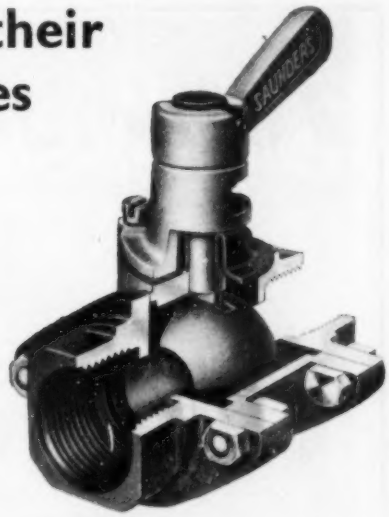

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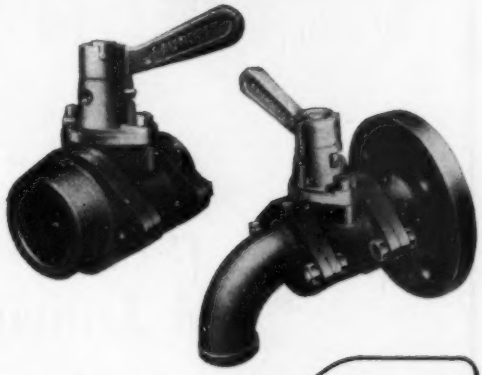

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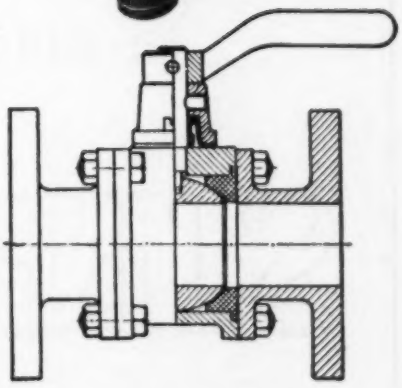

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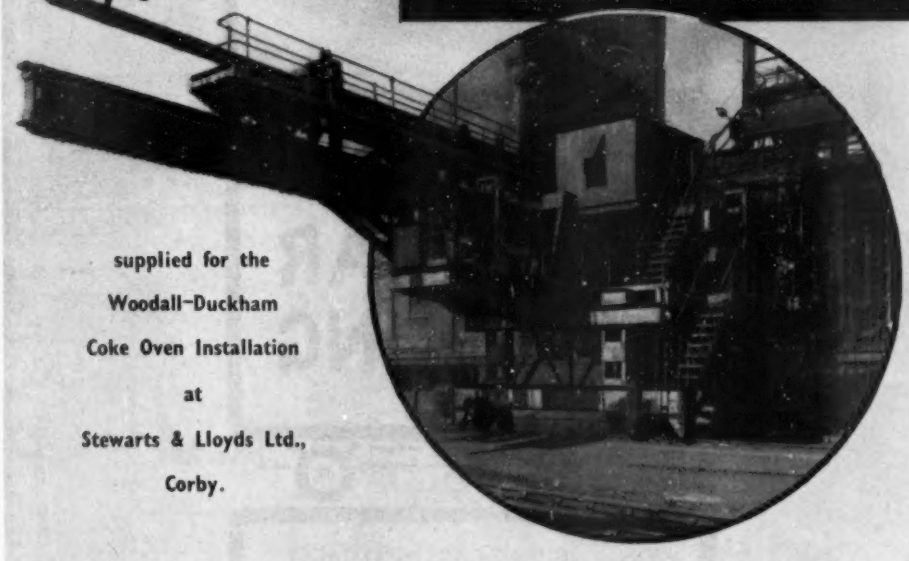

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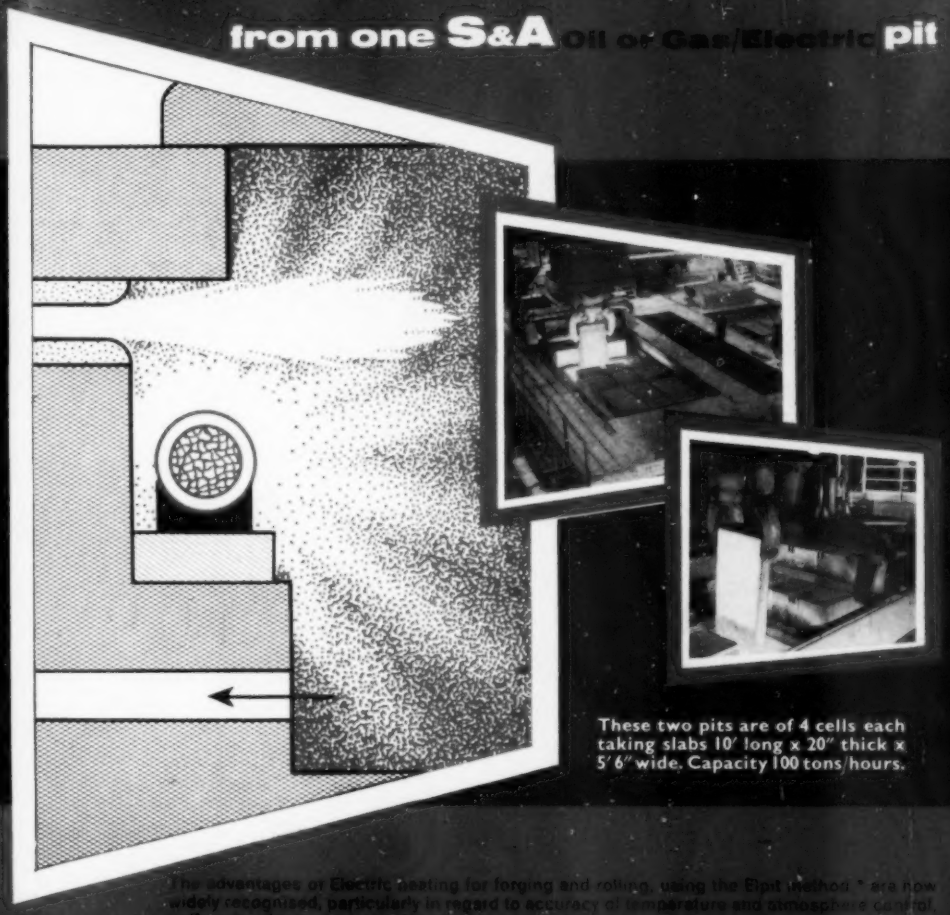

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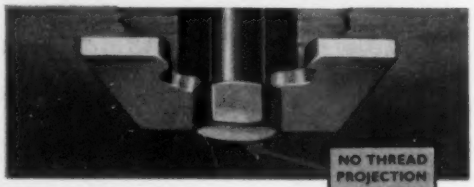

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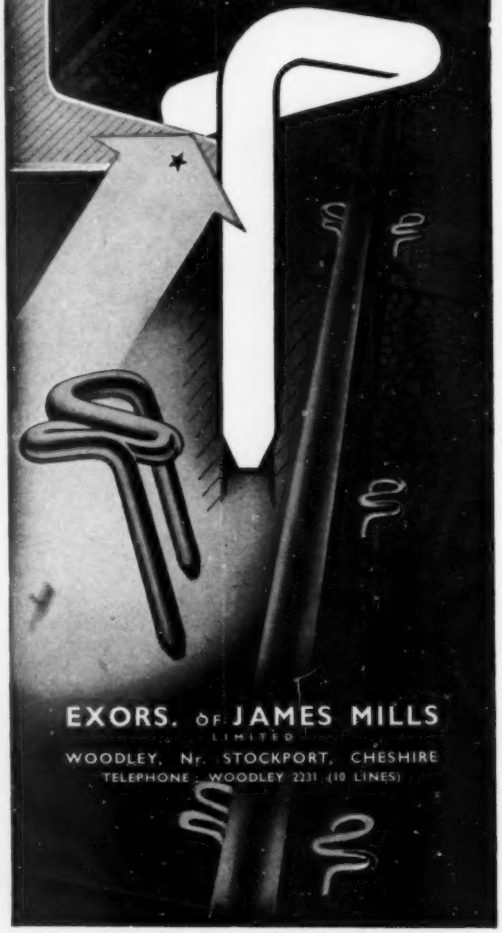

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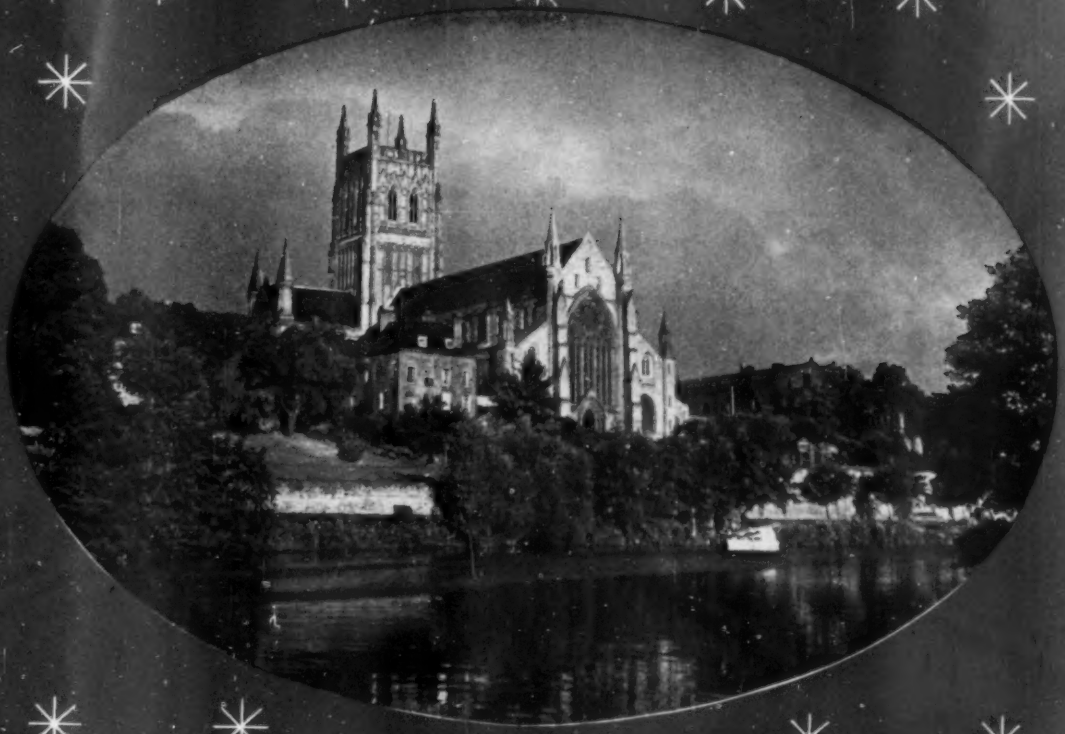

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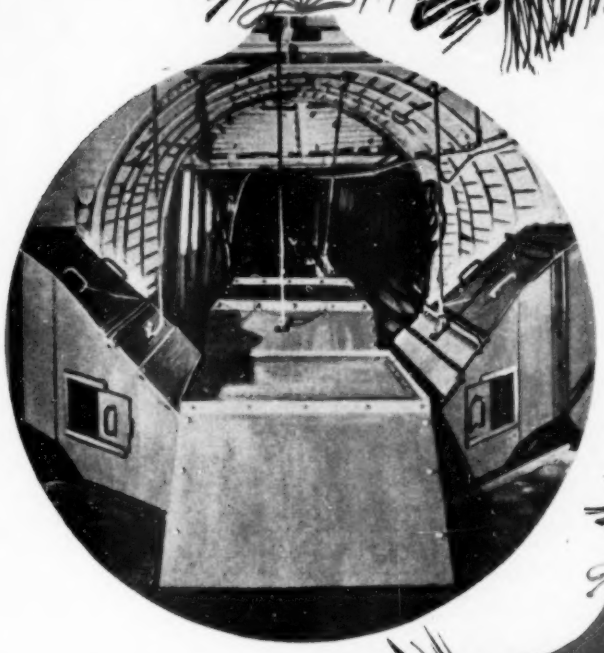

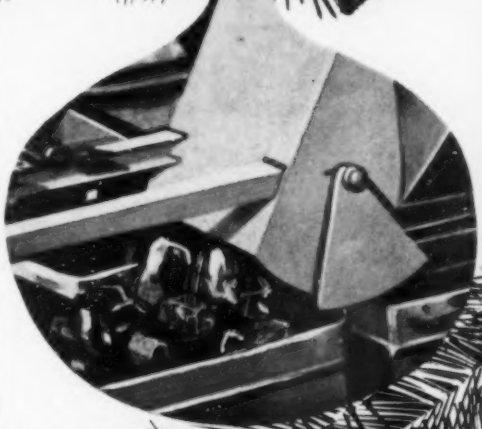

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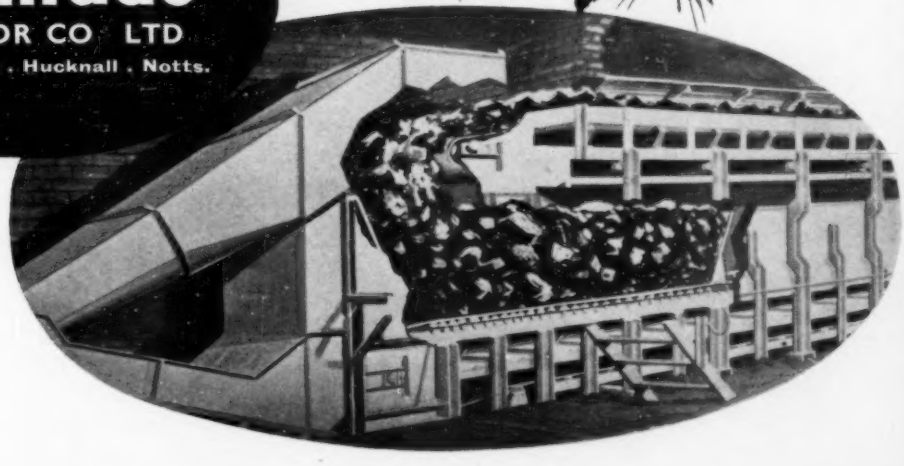

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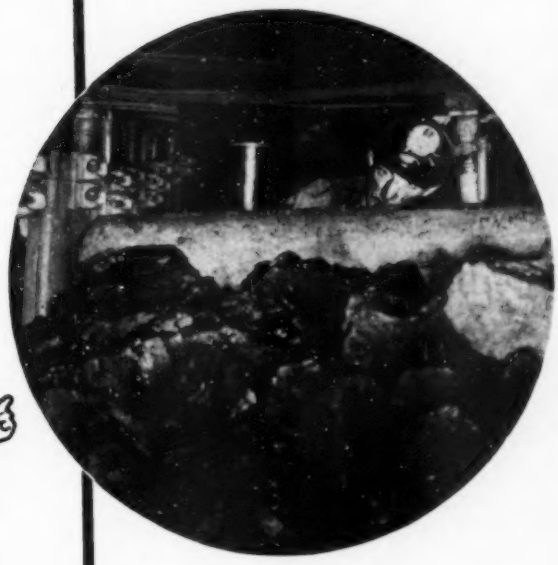

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Photo by courtesy of Fibres Division, Imperial Chemical Industries Ltd. Manufacturers of 'Terylene' polyester fibre.

C IS FOR CONVEYOR BELTS at a new I.C.I. plant in Cheshire, where eight Goodyear belts of rubber and 'Terylene' carry coke, burnt lime and coke/lime mixture. 'Terylene' was chosen for its flexibility and strength, which allows exceptionally deep troughing so that deck plates, skirt boards, etc., are eliminated and idlers can be spaced 50% wider apart. 'Terylene' also withstands the heat of the coke (carried at up to 120°C), is rotproof and resists moisture penetration. For the *right* conveyor belt, installed in the *right* way and maintained in the *right* manner, contact Goodyear Industrial Products Division at Wolverhampton.

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IRON & COAL
THE IRON AND COAL TRADES REVIEW

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On the Eve

THIS is not the week to worry greatly about matters economic. Christmas is with us, and for a few days we will give to life the roseate hue it takes on when looked at through a wine glass, and not worry about the colour of the figures in our bank statement on January 1. The Government assures us that nationally the economy is unwell, if not decidedly sick, but nobody seems to care. Our accountants tell us that, dealing as we do in coal and steel, and not in beer and skittles, our balance-sheets at the year-end won't come out as we would like them to, and of our own financial positions we are well enough aware. But not to worry. We'll put another lump of coal on the fire, which will please Lord R., and give it a shrewd knock with the steel poker that was a present last year from Aunt Alice, which ought to please Sir J.

"Beer, gin, and whisky profits climb, but steel-making takes a knock." Judging from the bills we have incurred with the wine merchant his sales graph will need a new piece of squared paper at the top right-hand corner, and Mr. Bass, Mr. Seager, and Mr. J. Walker will be able to buy another yacht apiece. But this is Christmas, and envious thoughts must be suppressed. "Thou shalt not covet," says the Book. Open the oven door and baste the turkey, and take a swig from the tankard to wish it luck. The farmers are doing all right (the Government sees to that, with our money), and so are the brewers. You may not think you are getting enough for the metal the stove is made of or the fuel it is fired with, but the farmer is content and the turkey could not now care less. Don't be envious. Keep your mind on the basting, and refill the tankard before your thoughts turn to other kinds of poultry. Are you beginning to think your own business goose is cooked, that the Chancellor and the TUC between them are slowly killing the goose that laid the golden eggs? Discard such thoughts. Just now it's goodwill to all men. Even tax collectors and shop stewards are human. You may doubt it next week, and are at liberty to do so. But not today. This is Christmas. Take the poker and press its point into the exact centre of that lump of coal. A twist of the wrist and see the flames go leaping up, bringing a message of comfort and cheer that the red-nosed carol singer outside can't put over half as well.

Beer, gin, and whisky up? Down with them! They can't be made without the help of coal and steel, and the brewers are making greater use of cans nowadays, are they not? That means more tinplate; so you are really helping yourself, for more tinplate means more steel, and more steel means more coal. Don't worry too much about the price. When a cynical but still hopeful tutor tried to drum the elements of economics into your thick skull he probably told you that if coal and steel were sick the whole national economy would be sick. Seems now he didn't know what he was talking about. There's no profit at all in coal and very little in steel. But beer and skittles are doing fine. So put on another lump of coal, that carbon copy of the sun, and bask in its warmth and radiance.

Other people can charge what they like; make jolly good profits? Musing like that won't get you anywhere. Wish Mr. Wood and Sir Cyril a Merry Christmas? Of course! Why not? Selwyn, too. After all, he did help you out over surtax, even if he did take it out of you in profits. And Mr. George Woodcock also. They are all good chaps, doing their best, no doubt. They couldn't do much worse, you think? That's not the spirit. This is a time of goodwill. Remember Tiny Tim, and wish a Merry Christmas to all. And a happy and prosperous New Year.

Count yourself in this last, even if you are in coal or steel. Because coal and steel are still the bases of Britain's prosperity. They may be down just a little bit at the moment, but they will come up again. With or without the Common Market. We believe in steel and coal. Next year we change our title to just that. After 95 years as IRON & COAL we become STEEL & COAL. To those star industries we hitched our wagon nearly a century back. Steel and coal will still be at the root of British industrial supremacy another 100 years from now, and as STEEL & COAL we shall continue to chronicle their history, as IRON & COAL has since 1866.

About to be born anew, we present to every reader, to all who, like us, work in and live by steel and coal, the age-old greeting: "A Merry Christmas and a Happy and Prosperous New Year." Put another lump of coal in the grate; there's plenty more where that came from. And if you are a consumer, don't be in a hurry to run down your stocks. Buy some more. You never know, the price may go up!

BASED ON THE RECOMMENDATIONS of the United Nations Mission, the Singapore Government has announced the formation of National Iron & Steel Mills, Limited, to cost £6,000,000.

"Steel & Coal"

ESTABLISHED in 1866 as THE IRON AND COAL TRADES REVIEW—and known generally and affectionately in recent years as IRON AND COAL—this journal will be renamed with the turn of the year. IRON becomes STEEL; IRON AND COAL becomes STEEL & COAL. More exact in description more modern in concept; yet inheriting all the power and goodwill acquired and developed over 95 years of service to industry.

The first issue of STEEL & COAL, on January 5, will reveal many changes. The journal will be a new size (with a type area of 10 in. by 7 in., giving 40 per cent. more space); it will be presented in a new style (the larger page allows and encourages a radical revision of layout, including the introduction of new typefaces).

The accent is certainly on change. But the changes that are being made are not being introduced merely for the sake of change. They have been planned in the knowledge that very many readers of IRON AND COAL have been "brought up" on IRON AND COAL since their student days—and even before in many cases. New features are being introduced, while some of the existing features are being restyled. But the IRON AND COAL reader can expect to feel utterly at home in the columns of STEEL & COAL and to appreciate that what has been done is designed to provide readers with an unrivalled service covering the coal and metallurgical industries in their many aspects.

Future Welsh Pits in Balance

FOUR collieries in the anthracite area of Dulais Valley, near Neath (Glam), and one at Bridgend, are on trial. A fifth pit in the area, Onllwyn No. 3, is likely to close and the future of two other South Wales collieries is in the balance. Mr. W. Whitehead, president of the South Wales Area of the National Union of Mineworkers, disclosed these plans by the South-Western Divisional Coal Board at a delegates conference in Cardiff on Monday.

The proposed closure in the near future of Onllwyn No. 3 colliery will make idle about 500 miners in the Dulais Valley. Pits in the same valley which are on a six-month trial are, Dillwyn, Seven Sisters, Abercrave, and Onllwyn No. 1, which between them employ 2,300 miners. Another pit on trial is Werntarw Colliery, near Bridgend, where 400 men are employed.

Delegates were told that two other collieries had a question mark against them, Nantgarw and Llanharan, whose combined labour force is about 800. The conference accepted the recommendations of the executive committee to find alternative jobs for the men made idle.

Passing Thoughts . . .

IT is more difficult for a person, once he has passed the age for apprenticeship to enter a skilled craft that it is to become a member of the Athenaeum or obtain a CBE, or a knighthood.—MR. NORMAN FISHER, former principal of the National Coal Board Staff College.

> *On so many occasions private enterprise is criticized for not showing more initiative and drive—what possible encouragement exists under present legislation and the penal taxation we have to face?*—MR. FRANK A. HURST, *chairman of George Turton, Platts & Company, Limited.*

Sixty-one per cent. of £A1,147,000,000 invested in Australia by private individuals since the war has been British capital. Only 28 per cent. of the investments were American and Canadian.—SIR ERIC HARRISON, Australian High Commissioner.

> *Where wages are concerned, whose word is law? Parliament's or the NCB's? . . . If it is found that a nationalized industry which comes begging for money is not subject to Parliamentary control, the moral is clear; it ought to be.—Sheffield Telegraph.*

To object, as the Scottish miners' union is doing, to the obsolete pits being closed as modern ones come into production, is to give notice to the taxpayer that there is no point in further capital expenditure on the mining industry in Scotland.—Glasgow Herald.

> *Mining has always presented a challenge, and required considerable toughness, both physically and morally. But the dreariness of many pits, and the lack of any real social life for the miners' wives, tend to cancel out this challenge.—Yorkshire Post.*

We need to stop working on prestige products and emblems of physical power in the world and prepare ourselves for the highly competitive world of the future—the world of the Common Market.—SIR JOHN COCKCROFT, FRS.

> *I do not think we have any professors of marketing in this country, but in America they are commonplace.*—MR. JOSEPH GLOAG, *head of the department of industrial administration, Heriot-Watt College, Edinburgh.*

Will the NCB never realize that the advice of a local miner with years of practical experience combined with an intimate knowledge of the geological conditions and difficulties existing in the area, is often of far more value than the opinions of an imported expert, no matter how many letters there may be after his name?—Letter in the Western Mail.

> *The problem . . . is to provide retraining facilities and alternative work for miners, not to employ more. It is for this rather than for substantial wage increases that the Coal Board should now be thinking of finding money.—Daily Telegraph.*

BIRMINGHAM SMALL ARMS COMPANY, LIMITED—Order-book and profits for the group as a whole for the first quarter of its financial year are substantially down on the comparable quarter for last year. This was mainly due, said Mr. Eric Turner, the chairman, to the low activity in the three motor cycle companies, which, with the steel company in Sheffield, could not expect any great improvement in business before next spring at the earliest. The likely reduction in profits now seemed "inevitable."

UK Steel Stocks

FALL OF NEARLY 5 PER CENT. IN THIRD QUARTER

STOCKS of steel held by users and merchants were reduced by 216,000 tons, or 4.7 per cent. during the third quarter of this year, states the Iron and Steel Board in its monthly production statement. Stocks of sheet showed the greatest proportionate fall, amounting to 7.2 per cent., although this is a somewhat less drastic reduction than that which took place in the first half of the year. Stocks of tinplate and other types of steel fell by 1.4 per cent. and 4.4 per cent. respectively.

Total stocks held by consumers and merchants at the end of September were 4,412,000 tons, compared with 4,628,000 tons at the end of June. Stocks of the various products held by consumers at the end of September (with the figure for end-June in parentheses) were:—Sheet, 548,000 (598,000) tons; plate, 760,000 (787,000) tons; tinplate, 149,000 (151,000) tons; other products, 2,428,000 (2,524,000) tons.

Stocks held by producers fell during the third quarter by 120,000 tons, giving a total reduction of stocks in the hands of producers, users, and merchants of 336,000 tons or 460,000 tons ingot equivalent. In the third quarter of 1960 stocks rose by 700,000 tons ingot equivalent. In the fourth quarter, producers' stocks have continued to fall, says the Iron and Steel Board, but exact figures for total stock movements will not be available until early in 1962.

World Trade in Steel

While efforts are being made to expand British exports of steel, it will be extremely difficult to maintain or to improve upon this year's exports in view of the intense competition from producers oversea, says the board. During the first half of 1961 total exports of steel from the main exporting countries in the world were slightly below the level reached during the first half of 1960.

British exports, however, rose slightly and the actual share of the UK in world exports increased from 15 to 17 per cent. Most types of finished steel, notably plates and sheets, contributed to this increase. The higher UK share of world steel exports for the various products were:—Ingots and semis, 5.6 per cent.; plate, 4 per cent.; sheets, 4.8 per cent.; tinplate, 0.2 per cent.; sections and bars, 1.8 per cent.; wire rods, 1.3 per cent.; rails and railway material, 4.6 per cent.; tubes, 1.4 per cent. (decrease); strip, 1.9 per cent.; other products, 4.7 per cent.

STEELWORKS TO CLOSE

BECAUSE of consistent lack of demand, Partridge, Jones & John Paton, Limited, a subsidiary of Richard Thomas & Baldwins, Limited, has decided to close the Pontymister steelworks and foundry at Risca (Mon) on January 27.

The company employs about 700 workers, who are to receive appropriate redundancy payments.

GRIFFIN & GEORGE, LIMITED—Mr. H. C. Mayer, executive director and secretary, has been appointed deputy managing director of the group.

Sir William McFadzean and BICC Executive

IN order to be free to concentrate on overall policy and the national and international aspects of group affairs, Sir William McFadzean is relinquishing, at his own request, the managing directorship of British Insulated Callender's Cables, Limited, while remaining executive chairman.

SIR WILLIAM MCFADZEAN

As executive chairman he will remain responsible to the board for supreme executive policy and the overall co-ordination of the company and group. He will delegate the executive operation to Mr. R. M. Fairfield and Mr. W. C. Handley, at present assistant managing directors. Mr. H. F. Akehurst, assistant managing director, will become executive director (export), and Mr. W. Fraser, a director, will become executive director (overseas companies). The changes will become effective on January 1.

Dangers of Industrial Noise

DELEGATES at the recent British Safety Council conference learned that in one Swedish factory 75 per cent. of all workers suffered hearing losses in varying degrees attributable to the noisy environment and that similar cases probably existed in British industry. Regular hearing checks were recommended as well as the provision of ear protection.

The Swedish surgeons, who presented papers on industrial noise, recommended the use of glass down (thin glass fibres, like cotton wool), as a safeguard against noise-induced hearing loss. The glass down was now available in Britain and would be known as "Anti-noise."

OVERALL PRODUCTIVITY in the Durham Division of the NCB in the 48th week of the year reached 23.70 cwt. per manshift compared with 23.13 cwt. in the same week of 1960. OMS at the face reached 67.40 (65.47) cwt.

Coalfield News

Miners to Show Gratitude with Blood Donations

AS an expression of gratitude to the Blood Transfusion Service, which helped to save the life of a 16-year-old boy after he had been critically hurt underground, miners at Kingshill Colliery, Shotts (Lanarkshire), are to organize their own blood donation campaign.

Mr. John Hughes, manager of Kinghill No. 3 Colliery, will give the first pint of blood when the Western Regional Blood Transfusion Service visits the mine on Wednesday.

COAL AND COKE shipments from the Tyne during the first 11 months of this year totalled 5,626,300 tons, an increase of 502,685 tons over the corresponding period of 1960. It is likely that shipments will show an improvement this year for the first time since 1952.

MIDLOTHIAN MINERS at a Musselburgh rally on Sunday passed a resolution demanding that the Government rescind the "bankrupt measures" of pit closures and cuts in rail and air services in Scotland. Speakers included Mr. James Hill, MP for Midlothian.

ITEMS DEALING with Peterlee New Town (Co. Durham), the Bluebell Railway Line, in Sussex, the Schoolboys' Exhibition, and coal output records set up by the mining industry during 1961, are featured in the January issue of Mining Review, the National Coal Board's newsreel.

AT THE ANNUAL MEETING of the Markham Colliery Disaster Fund administrators, the possibility of increasing grants to dependants was discussed and the position is being examined. It was agreed to increase the Christmas and summer grants to widows by £5 each to £25 for the coming year.

HEAD of the Mining Department at Leeds University, Prof. H. J. King went down Barrow Colliery, near Barnsley, with 10 final-year students to provide an insight into one of the most mechanized pits in the country. A further 10 final-year students went to Rockingham Colliery, Hoyland Common.

FORMER Labour MP for Barnsley, Mr. Sidney Schofield, Area compensation agent, has been elected to Yorkshire's third seat on the National Union of Mineworkers' executive. He defeated Mr. B. M. Yates, delegate of Rossington NUM branch to the Area Council, by 1,261 branch votes to 1,232.

OVER THE NEXT FEW YEARS the National Coal Board, with the co-operation of local authorities, wants 15,000 houses built for mineworkers, near the country's most productive coalfields, in an attempt to foster recruitment to the industry, states Lord Robens, in an interview reported in Coal News, the mining industry's newspaper.

DELEGATES OF THE Scottish Area of the National Union of Mineworkers in Edinburgh last Friday voted for a one-day protest strike against the closure of pits in Scotland and in support of wage claims. It is proposed that the strike, not yet officially sponsored, should coincide with the lobbying of MP's at Westminster, probably on February 2.

Mr. T. F. BALDRY has been appointed undermanager at Arley Colliery in the Warwickshire Area of the West Midlands Division of the NCB. He began his mining career in Northumberland, but since 1947 has been employed in various capacities at Hamstead Colliery in the South Staffordshire and Shropshire Area, latterly as senior pit overman and mechanization overman.

North-Eastern NCB Appointments

FOLLOWING the recent appointment of Mr. E. Hoyle as general manager of No. 5 (South Barnsley) Area, North-Eastern Divisional Coal Board, Mr. Frank Fairclough, at present production manager of that Area and president of the Yorkshire branch of the National Association of Colliery Managers, is to succeed Mr. Hoyle as production manager of the No. 2 (Doncaster) Area from January 1.

Mr. Fairclough, a Yorkshireman, began work at Snydale Victoria Colliery at 13. He attended Normanton, Wakefield, and Barnsley technical colleges and for a time was a West Riding County Council instructor of mining, obtaining his undermanager's certificate in 1928 and his first-class colliery manager's certificate in 1932.

In 1936 he became undermanager at Methley Junction Colliery and transferred to Whitwood Colliery the following year. In 1940 he became assistant manager at Micklefield and Ledston Luck collieries, and, in 1943, manager of Woolley Colliery, near Barnsley. He was appointed agent of Woolley in 1947 and deputy Area production manager of the No. 6 (North Barnsley) Area in May, 1948, assuming his present post in 1958.

In addition to his work for the NACM, he is an active member of the Midland Institute of Mining Engineers and is also a member of the Mining Advisory Committee at the Barnsley College of Technology.

NCB Assurance to Miners on Wage Negotiations

DECISION of the National Coal Board not to reply to the miners' wages and hours claims until January 17 has been accepted by the National Union of Mineworkers. Mr. S. W. G. Ford, the president, said on Thursday of last week that the union would expect the board to enter into "realistic negotiations" on that date. The NUM executive had considered a letter from the NCB which confirmed Lord Robens' recent statement that the Coal Board's approach to the claims would be "entirely free and uncommitted." Mr. Ford said that the miners had already made it clear that they were opposed to the Government's pay pause, and intended to disregard it in proceeding with their claims.

The executive also considered the recently proposed increases in the price of certain coal for industrial users, and passed a resolution calling for a co-ordinated national fuel policy and blaming Government policy for the NCB's financial difficulties.

During the meeting Mr. Will Paynter, NUM general secretary, who recently lost his seat on the General Council of the TUC, refused to be nominated again for a TUC seat.

CHARGEHAND STEEL ERECTOR, Mr. B. Szamlowski (39), who was struck on the head by a length of piping during the construction of a power station in 1959, was awarded £2,600 damages at Nottinghamshire Assizes against his employers, International Combustion, Limited, London, W.C.1. It was stated that since the accident Mr. Szamlowski had become too nervous to carry on working at heights. The company admitted liability.

National Safety Year

Coal Mining's All-out Effort in 1962

AN all-out effort to reduce the number of accidents at mines is to be made by the coal industry, which is to designate 1962 National Safety Year. Lord Robens, chairman of the National Coal Board, launched the new campaign at a conference in London last week attended by divisional chairmen and senior production staff from divisions and areas.

The conduct of the campaign will be the responsibility of committees appointed at national, divisional, and area levels. H.M. Chief Inspector of Mines is being invited to serve on the national committee. A special Safety Exhibition designed by headquarters and in which it is hoped the Safety in Mines Research Establishment will collaborate will visit all divisions.

National safety, poster, and slogans competitions are being organized and other proposals include the issue of booklets on safety to men working on power-loaded faces warning them of the special features of such faces and advising them how accidents may be prevented; colliery drives to encourage the proper use of protective equipment and clothing; and tidiness competitions at collieries.

Disturbing Number of Accidents

Lord Robens said that he was greatly impressed by the conference of the NACM at Edinburgh in June, which was entirely devoted to safety matters and included an exhibition of safety appliances and methods. The industry could not rest content with the present accident figures, despite the progress that had been made, and the board had decided that an all-out effort should be made to reduce them.

He was disturbed at the number of accidents still taking place underground and disturbed and surprised at the accident rate on the surface, where the hazards were much less.

Mr. T. A. Rogers, HM Chief Inspector of Mines, commended the idea of a special safety year and said that the board would have every possible support from the inspectors. Each of the union representatives also pledged the support of their organizations in furthering the campaign.

Mr. A. E. Hiscox, president of the National Association of Colliery Managers, on behalf of the NACM said he thought it was realized by everyone that the colliery manager, by the very nature of his work and responsibilities was always in the forefront of the battle against accidents. The National Safety Year would be of considerable help to management in its continual fight to keep accidents and industrial diseases to a minimum.

Great strides in safety techniques had been made in the coal-mining industry, but he thought it was now necessary to re-examine what had been done to try to see through the darkness of accident trends in order to get a much clearer picture. Since 1842 accident prevention in coal mining in Britain had been the subject of numerous Acts and Regulations. In addition considerable sums of money were being spent on education and training.

In the light of what was already being done, legislation, education, and general supervision alone were not enough, he said. "We must create a conscious effort for accident prevention in all persons who are continually in conflict with existing physical conditions which they have to deal with from day to day." Because of the ever-changing techniques in mining methods, which tended to bring new hazards, meetings such as that should go down the line to colliery level so that management and men were made receptive and all became safety conscious. He hoped that they would be able to look back to 1962 as a year when the coal-mining industry made history in its accident prevention.

Also supporting Lord Robens at the meeting which launched the campaign were Mr. S. Ford, president of the National Union of Mineworkers, Mr. J. Crawford, secretary of the National Association of Colliery Deputies, Overmen, and Shotfirers, and Mr. J. A. Bullock, president of the British Association of Colliery Management. Mr. H. E. Collins presided in the absence through illness of Mr. W. V. Sheppard, director general of production, NCB.

West Midlands NCB Areas to Merge

ANOTHER merger of National Coal Board Areas—this time in the West Midlands Division—is announced. The South Staffordshire & Shropshire and Cannock Chase Areas are to be amalgamated on January 1, 1962. Mr. F. L. White, Area general manager of Cannock Chase Area, who has also been responsible for the South Staffordshire & Shropshire Area since November 1, will be the Area general manager of the new combined Area, the headquarters of which will be at the existing Cannock Chase Area offices at Cannock.

Full amalgamation will take some months to effect, but there will be no redundancy among staff. In fact, the divisional board will be able to achieve considerable savings in staff by placing those affected in suitable existing and future vacancies elsewhere in the division. Full consultation has taken place with the staff trade unions, the staff have been informed, and the proposals have also been before the Divisional Consultative Council.

There are now only five collieries in the South Staffordshire & Shropshire Area—Baggeridge and Hamstead collieries in South Staffordshire and Highley, Granville, and Madeley Wood in Shropshire. There are at present 11 operational collieries in the Cannock Chase Area. With this amalgamation, the number of Areas in the Division will be reduced from four to three.

Sir Robert Shone to Head Economic Council

EXECUTIVE member of the Iron and Steel Board since its formation in 1953, Sir Robert Shone has been appointed Director-General of the proposed National Council for Economic Development, and will take up the post early next year.

SIR ROBERT SHONE

Announcing this in the House of Commons on Monday during a statement on economic planning, Mr. Selwyn Lloyd, Chancellor of the Exchequer, said he was making the appointment and also recruiting a small independent staff, while still waiting for the TUC to decide whether or not to co-operate on the Council. Sir Robert, who has taken an active part in general economic affairs, is a member of the executive committee of the National Institute of Economic and Social Research. He is also joint chairman of the steel committee set up under the Council of Association between the United Kingdom and the European Coal and Steel Community.

Born in 1906 and educated at Sedbergh School in Yorkshire, his family was connected with the steel industry in Liverpool going back to the middle of the last century. He graduated in engineering at Liverpool University, and later trained with Stewarts and Lloyds, Limited, and as a junior engineer with shipping companies. He then obtained a Commonwealth Fellowship for two years and studied economics in the United States.

Following a short period of lecturing at the London School of Economics, Sir Robert joined the British Iron and Steel Federation. He was a director of the Iron and Steel Control, in charge of prices, costs, and statistics, during the war and later became director of the Federation. He was appointed executive member of the Iron and Steel Board on its formation in 1953. He is an honorary member of the council of the Iron and Steel Institute, and was recently a vice-president of the Royal Statistical Society.

Sir Robert was the leader of one of the first of the industrial teams to visit Russian plants in 1955 after the Stalinist period. He also took a leading part in the discussions with French planners in London and Paris this year. He was made CBE in 1949, and knighted in 1955.

Sir Robert will receive a salary of £7,000 in his new post, the same as his present salary as the only whole-time member of the Iron and Steel Board.

GEORGE TURTON, PLATTS & COMPANY, LIMITED—Future railway wagon developments may well be towards larger wagons, says Mr. F. A. Hurst, the chairman, in his annual report, and it is for this special duty that the firm's hydro-pneumatic buffers are so suitable. Higher tax had nullified the higher profit of £125,477 (£115,864) so that he net profit was £6,572 less.

Personal

Mr. ARTHUR SYKES has retired as director and technical consultant to David Brown Industries, Limited, after 56 years with the David Brown organization.

Chief engineer of the engine division of Leyland Motors, Limited, Mr. NORMAN TATTERSALL has been appointed a director of Spain's largest commercial vehicle manufacturers, Empresa Nacional de Autocamiones, SA.

In protest against the Government's policy on fuel, especially its decision to import methane, Sir PATRICK DOLLAN resigned last week-end as chairman of the Scottish Fuel Efficiency Committee. He will continue to serve as a member of the committee.

Former director of atomic energy and research at Harwell, Sir JOHN COCKCROFT, FRS, the British Nobel prize winner, was awarded the Wilhelm Exner Medal in Vienna last Friday, for outstanding achievements in the fields of industrial and trade research.

MR. T. BROOKS is retiring from executive office and from the board of Hattersley (Ormskirk), Limited, engineers and iron and non-ferrous founders, of Ormskirk (Lancs), on January 1, after more than 40 years' service with the company and its predecessors in business.

Managing director of Joy-Sullivan, Limited, manufacturers of mining and quarrying machinery, of Greenock (Renfrewshire), Mr. J. R. BINGHAM has been appointed director for next year's 10th Oxford University Business Summer School, a four-week study course to be held at Brasenose College from July 2-28.

For the seventh year, Mr. T. G. W. WATSON, of R. & H. Green & Silley Weir, Limited, boiler repairers, brassfounders, etc., of London, E.C.3, has been appointed chairman of the River Thames Shiprepairers' Association. Vice-chairman is Mr. A. W. HELEY, deputy manager of the London, E.16, branch of Harland & Wolff, Limited, shipbuilders, brass and ironfounders, etc., of Belfast.

The Minister of Pensions and National Insurance has made the following new appointments to the Industrial Injuries Advisory Council:—MR. S. CHAPMAN, director of the Association of Chemical and Allied Employers; MR. A. MARTIN, general secretary of the Nottingham Division of the National Union of Mineworkers and a member of the General Council of the TUC and of its social insurance and industrial welfare committee; and MR. J. G. C. MILLIGAN, deputy director-general of industrial relations, National Coal Board.

MP Praises Wire Rope Firm's Export Success

EXPORT record of D. Morgan Rees & Sons, Limited, manufacturers of wire rope, of Cardiff, which has sent 30 per cent. of its total production abroad since the end of the last war, was praised by Mr. Donald Box, MP for Cardiff North, during his visit to the works last Friday. Products of the firm, which has recently completed a major expansion scheme, were on show this year at trade exhibitions in Moscow, Poland, and East Germany.

During his tour of the factory, Mr. Box met the oldest employee, Mr. Jack Westrip (88), and Mr. David Morgan (20), an assistant in the metallurgical laboratory, who received the Duke of Edinburgh's gold award for youth club activities at St. James's Palace on Wednesday.

ECSC STEEL OUTPUT FALLS

But Orders for Finished Products Improve

ALTHOUGH production of raw steel in the six countries of the European Common Market fell 6 per cent. during November, new orders for finished steel products, which began to rise in October, continued their improvement. The High Authority of the European Coal and Steel Community reports that total production of raw steel by the ECSC in November was 5,870,000 tons, compared with 6,250,000 tons the previous month. The decline in production was spread throughout the six countries, but the largest absolute fall was in Western Germany where output, at 2,620,000 tons, was 124,000 tons lower than in October.

Although production capacity in the ECSC has continued to grow over the last few months, demand, although still high, has begun to level out. To prevent this leading to undue price cutting, producers in most countries have reduced output to between 92 and 96 per cent. of capacity. Even in Italy, where economic activity remains buoyant, steel companies are currently working about 2 per cent. below capacity.

Orders for finished steel products in November amounted to 4,360,000 tons, compared with 4,320,000 tons in October and less than 4,000,000 tons in each of the months, July, August, and September.

Increase in Exports

The lengthening order-books represent primarily an increase in demand from third countries which has offset a fall in orders from inside the Community. Some revival in activity, however, was felt in the German market last month. As it is usual within the ECSC for orders to show a seasonal improvement in October and November, followed by a slowing down in December, some shortening of order-books is therefore expected this month.

Two iron-ore mines in Germany which together employ about 900 workers are expected to be closed soon, and production in other mines is expected to be cut back. Iron-ore mining in Germany has been struggling for years against the competition of higher grade ores from Sweden and other sources oversea. Next to the United States, Germany is the world's largest importer of iron ore; in 1960 she took 24 per cent. of the world's iron-ore imports, compared with 31 per cent. bought by the US and 18 per cent. by the United Kingdom.

Although a trial shaft is to be sunk at Staffhorst, on the River Weser, to establish whether newly discovered ore deposits there are worth exploring, Dr. H. G. Sohl, managing director of Thyssenhütte, has forecast that the proportion of imported ores used in Germany would continue to grow. Sweden, which last year supplied over 8,000,000 tons of iron ore, would remain the most important source.

The German steel industry is also a partner in international projects to exploit the deposits in Liberia and Mauretania.

FOR THE SECOND consecutive week, Haunchwood Colliery (Warwickshire) has broken its productivity record. New best figures for the week ending December 9 were 122.5 cwt. at the face, an increase of over 7 cwt., and 39.3 cwt. overall.

RapieR Giant Walking Dragline for Italy

ORDER for a giant walking dragline, to cost not far short of £1,000,000, has been received by Ransomes & Rapier, Limited, Ipswich, a member of the Newton Chambers group. The RapieR W1800, which will be used for stripping overburden from lignite (brown coal) deposits in the province of Potenza, Italy, is to be supplied to Società Meridionale di Elettricità.

A similar walking dragline, bought by the NCB for £905,000, is operating in open-cast coal workings in South Wales and representatives of the Italian undertaking went to see it in action before they placed their order. It is believed to be one of the biggest machines of its kind in the world and is certainly the biggest at present operating in Europe.

Work on the Italian order will begin early in the New Year, shipments of parts will start in the early part of 1963, and the machine should be ready for work in the spring of 1964. Negotiations for the order were conducted through International Engineering Equipment, Ransomes & Rapier's representatives in Italy.

The walking dragline will be fitted with a 265-ft. boom which will probably be made at the Thorncliffe works of Newton Chambers, and the 40 cu. yd. heavy duty bucket, which will be operated at 245-ft. radius, will be made by Hadfields, Limited, Sheffield. At the present time a RapieR W1800 is being made for Stewarts and Lloyds Minerals, Limited, for operation in the ironstone mines in the Corby district, and another is nearing the final stages of erection at Roxby, Scunthorpe, for the United Steel Companies, Limited.

More Trade with Eastern Block Urged

URGING that full advantage be taken of trade which is offered, Lord Boyd-Orr warned Britain against "economically cold-shouldering the planned economy countries," in his presidential report to the British Council for the Promotion of International Trade, in London recently.

He said that the Eastern block offered the most rapidly expanding market in the world. "If we neglect it, we shall be laying up greater trouble for ourselves in the future than is apparent from our trade figures today."

Orders Placed

AEI Contract for Steel Mill Equipment

VALUE of a contract recently received by the heavy plant division of Associated Electrical Industries, Limited, is nearly £440,000. The order, placed by Stewarts and Lloyds, Limited, is in connection with plans for re-equipment and new construction at the firm's Corby (Northants) works and covers the supply, erection, and commissioning of electrical plant at No. 1 strip mill and at a new 20-in. bar mill.

Modifications at No. 1 continuous hot-strip mill, involve the replacement of the five existing finishing-train stands and motors.

CONTRACT WORTH £100,000 has been received by Crompton Parkinson, Limited, through Lyddon & Company, Limited, for the supply of over 400 electric motors for a large paper mill at Calarasi, near Bucharest, Rumania.

FEED HEATING and evaporating plant, valued at £2,000,000, for the Eggborough (Yorks) power station, has been ordered by the Central Electricity Generating Board from Hick, Hargreaves & Company, Limited, engineers and ironfounders, etc., of Bolton (Lancs).

SEWAGE PUMPING PLANT worth £18,500 is to be supplied by Gwynnes Pumps, Limited, an associate of W. H. Allen, Sons & Company, Limited, to Leicester City Council. W. H. Allen has also received a contract for pumping plant for the same scheme to the value of £7,400.

TWO EXPORT ORDERS have been received by W. J. Jenkins & Company, Limited, Retford (Notts). One from the municipality of Port Elizabeth, South Africa, worth about £50,000, is for an extension to the coal carbonizing plant built by the company in 1954-55. The other, from Spain, worth about £40,000, is for two asphalt batch mixing plants.

CONTRACT FOR a new mine shaft at Zawar, Udaipur Province, has been awarded by the Metal Corporation of India, Limited, to the Indian branch of the Cementation Company. Valued at £192,750, the contract is for the sinking of a shaft some 990 ft. deep at Zawar Mine, about 2,200 yds. of drivage, and the construction of four insets and two ore pockets.

ORDER WORTH £26,000 for remote handling equipment has been placed with Nuclear Equipment, Limited, by the English Electric Company, Limited. The equipment includes a mechanical arm with a capacity of 750 lb. and four pairs of master slave manipulators will be used for remote handling at Sizewell nuclear power station, Suffolk.

ORDER for high-capacity ore wagon handling and unloading equipment to be installed at Port Elizabeth, South Africa, has been placed with Strachan & Henshaw, Limited, Bristol. The plant will unload various classes of ore at a rate of about 1,500 tons per hour. The order, valued at over £136,000, has been placed by Robins Conveyors (South Africa) Pty., Limited, Johannesburg.

CONTRACT FOR four 500 mW steam generators, valued at £19,000,000, has been awarded jointly to Foster Wheeler, Limited, manufacturers of oil refinery equipment, steam boilers, and evaporators, etc., of London, S.W.3, and John Brown Land Boilers, Limited, Clydebank. The generators, to be installed in the Central Electricity Generating Board's projected power station at Eggborough (Yorks), are to be of the natural circulation re-heat type.

Common Market Tariff Text in English

ENGLISH translation of the Common External Tariff of the European Economic Community has been prepared by the Board of Trade, and is to be published in 11 parts. The first part, devoted to machinery, electrical equipment, vehicles, aircraft, vessels, and certain associated transport equipment (chapters 84-89 of the Brussels Nomenclature) is now available from H.M. Stationery Office, Kingsway, London, W.C.2, price 4s. (by post 4s. 5d.). Copies of the translation can also be seen at regional Board of Trade offices.

It is hoped to complete publication of the remaining 10 parts by the end of February, including chapter 73 which embraces base metals, iron and steel, and articles thereof, and chapters 74-83 dealing with non-ferrous metals and alloys, and articles thereof, tools, implements, and cutlery.

The text of the translation, it is pointed out, has not been cleared with the European Economic Commission or member Governments of the Community, and the Board of Trade is solely responsible for it.

"Poaching" of Craftsmen in Steel Industry

REPORTING that one in every four craftsmen trained by Samuel Fox & Company, Limited, branch of the United Steel Companies, Limited, left the firm at the age of 21, Mr. G. J. Cumming, education officer, said that although the firm did not "wail" about the poaching of trained employees, some equitable means of spreading the cost of educating and training craftsmen throughout the British economy should be devised.

He was speaking at the firm's annual prize distribution, at which the Lord Mayor of Sheffield, Ald. J. S. Sterland, presented awards. Prizewinners included 47-year-old Mr. Ronald Hampshire, who received the City and Guild bronze medal and gained the highest marks in the country in an iron and steel operatives' course on carbon and special heat treatment.

£14,000,000 Order for Power Plant

VALUED at £14,000,000, the generating plant contract for the 2,000 mW coal-fired power station to be built at Eggborough (Yorks), has been given to the Associated Electrical Industries, Limited, by the Central Electricity Generating Board.

The plant will consist of four single-line turbine generators, each producing 500 mW., condensers of the new axial design, developed to cope with problems of generator-house foundations, and boiler-feed plants driven by steam turbines. The output will be 22,000v, three-phase, at 50 cycles per second.

FOLLOWING the recent signing of an agreement between Chilton Electric Products, Limited, and Westinghouse Electric Corporation of America, a series of technical conferences is now being held. Under the terms of the agreement Chilton has acquired sole UK sales and manufacturing rights for Westinghouse AB De-ion moulded case circuit breakers.

STEWARTS AND LLOYDS

Trading Profit Down by £4,200,000

GROUP profits, before tax, of Stewarts and Lloyds, Limited, fell from £18,200,000 to £14,000,000 for the year to September 30, 1961, and a final dividend of 10 per cent. on capital increased by a two-for-nine rights issue makes a total of 15 per cent., the same as for the previous year. The net profit, after tax and outside interests, etc., is down from £10,600,000 to £7,400,000.

The fall in profit is attributed to three main reasons: the absorption, without compensating home trade price increases, of significant additions to costs, mainly fuel, wages, and salaries; a reduction in exports of tubes to the oil and natural gas industries, and a fall in export prices for general purpose tubes as a result of competition from oversea tubemakers.

Activity in the steel and tube works was well maintained, except in those producing for the oil and natural gas industries. Group sales to customers increased from £139,400,000 to £158,300,000.

Production in UK

Representative outputs for the UK group in 1961, with the corresponding figure for 1960 in parentheses, were:—Pig-iron, 2,321,000 (1,922,000) tons; steel ingots, 1,732,000 (1,870,000) tons; spun-iron pipes and castings, 493,000 (402,000) tons; steel tubes, 905,000 (1,008,000) tons. The 1961 figures for pig-iron and spun-iron pipes and castings include output by Staveley Iron & Chemical Company, Limited.

Tonnages despatched during the year were:—Steel tubes (home, excluding oil), 524,000 (533,000) tons; oil industry (home), 22,000 (20,000) tons; export (excluding oil) 232,000 (248,000) tons; oil industry (export), 126,000 (205,000) tons; spun-iron pipes and castings (home), 392,000 (310,000) tons; spun-iron pipes and castings (export), 480,000 (393,000) tons; total (including Staveley Iron & Chemical), 480,000 (393,000) tons.

Capital expenditure on plant and equipment at home and oversea amounted to £10,200,000. During the year capital schemes were authorized up to a total of £42,274,000, of which a large proportion was to provide for the major development of iron and steel capacity at Corby. The balance of the schemes sanctioned now amounts to £47,875,000.

Lord Riverdale Now Heads Balfour & Darwins

THE recent death of Mr. F. Thompson-Schwab, chairman of Balfour & Darwins, Limited, the steel manufacturing group, has made changes necessary in the group's boardroom. Lord Riverdale, who was deputy chairman, now becomes chairman, with Mr. H. E. Hill deputy chairman. Mr. Hill has also been appointed chairman of Darwins Group, Limited, and subsidiaries, with Mr. Mark Balfour as deputy chairman.

Mr. R. Willis and Mr. P. E. H. Wilde have been appointed joint general managers of Darwins Group and subsidiaries.

New Metallurgical Society

FIRST lecture meeting of the newly formed Stoke-on-Trent Metallurgical Society will be held at the Town Hall, Hanley, at 7.30 p.m. on January 9, when Mr. Tom Grey-Davies will talk on "The Function of a Metallurgical Society." Mr. Grey-Davies has been secretary of the Newport and District Metallurgical Society since its formation 28 years ago.

Chairman of the new society is Mr. N. B. Rutherford (Thomas Bolton & Sons, Limited). Other officers and committee are:—Vice-chairman, Mr. E. S. White (T. M. Birkett, Billington & Newton, Limited); treasurer, Mr. D. Clarke (Royal Ordnance Factory, Crewe); secretary, M. B. M. Hardman (North Staffordshire College of Technology, Stoke-on-Trent); committee: Messrs. G. H. Charsley, J. Dowell, D. Heath, D. Lowe, W. J. Williams, T. J. Stanistreet, J. L. Wolfenden, and C. S. Dobson.

DSIR Places First Development Contract to Industry

FIRST development contract to industry has been made by the Department of Scientific and Industrial Research. Valued at about £200,000 it goes to Craven Bros. (Manchester), Limited, for the development of a large gear-grinding machine. Craven Bros. will contribute towards the development costs and also provide the special capital equipment necessary for the manufacture of the machine, which will be designed to handle gears up to 5 ft. in diameter and provide a very high degree of accuracy and surface finish.

The whole development, for which Craven Bros. will considerably expand its design and development team, is expected to be complete in three to four years. DSIR support will cease when the prototype is successfully demonstrated. It is hoped that this development will lead to a range of fully patented machines capable of grinding gears up to 150 in. in diameter.

CONTROLLED BY Japanese interests, a company named Iron & Minerals Development Company (Private), Limited, has been registered in Southern Rhodesia, reports Barclays Bank DCO from Salisbury. The new company will develop iron-ore claims near Hunters Road and eventually some 10,000 to 12,000 tons of iron ore a month may be railed. Delegates from the Kawasaki Steel Corporation, Japan, have visited the country in connection with the project.

In Parliament

GKN-Delta Metals Proposal for Subsidiaries

PROPOSED transfer of subsidiary companies by Guest, Keen & Nettlefolds, Limited, and the Delta Metal Company, Limited, would create a "tremendous monopoly" in brass rod and wire for Delta Metals, and of brass screws for the Guest, Keen group, claimed Mr. DENIS HOWELL (Lab.). He said that the Delta Metal subsidiary concerned in the proposed deal had been acquired by the company within the last six months, and in the last three years it had acquired 15 companies in this field. As the Government was one of the largest buyers of brass products, it would also create "tremendous complications" for the taxpayers, and, generally speaking, would be against the public interest.

Mr. Howell, who sought to move an adjournment for the discussion of the matter as one of urgent public importance, was told by the Speaker that there was no ministerial responsibility in these circumstances. His application was refused.

[The two subsidiaries referred to by Mr. Howell are United Non-Ferrous Metals, Limited (GKN), and Davis & Timmins, Limited (Delta Metals). As reported in IRON AND COAL last week, the two principals are holding talks for the furtherance of their "mutual interests" with regard to the subsidiaries. United Non-Ferrous Metals manufactures metal rods, and Davis & Timmins specializes in screws, bolts, and nuts.]

THE HOUSE ADJOURNED for the Christmas recess yesterday (Thursday), and will reassemble on Tuesday, January 23.

AT THE END of October 485,100 were employed in the iron and steel industries and the estimated number on short time in the week ended October 28 was 18,700. This written reply was given by the Minister of Labour to Sir Cyril Osborne (Con.).

ASKED BY Mr. John Farr (Con.) if steps could be taken to eliminate delays by the Customs in examining machinery and parts returned by customers oversea for reconditioning in the UK, Mr. Anthony Barber, Economic Secretary to the Treasury, said every effort was made to clear such machinery and parts expeditiously.

IN REPLY to Mr. A. Woodburn (Lab.), who said that practically a new small town had been built at Tullibody and Sauchie to accommodate incoming miners to work at Glenochil Colliery (Clackmannanshire), which is to close next year, the President of the Board of Trade said that steps would be taken to bring the oportunities of the area to the notice of industry seeking labour and sites.

ANY COMPARISON of the prices of imports and home-produced pitprops would be misleading without full details of quality and specifications, the President of the Board of Trade told Mr. David Gibson-Watt (Con.), who alo asked about the tonnage of softwood imported into the UK from France in the last three years. The Minister said figures for imports of pitprops, pitpoles, and pitbars recorded in piled cubic fathoms and value, were available from the Trade and Navigation Accounts.

THE Pori Metal Works of Outokumpu, Limited, Finland, is being enlarged with a new copper tube mill which will produce copper tubes up to 50 metres in length. Production will start next year.

Obituary

Mr. T. JONES, works manager (mills) at the Lackenby works of Dorman Long & Company, Limited, Middlesbrough, died recently. He was formerly works manager at Dorman Long's Britannia works.

Mr. ERNEST CRADDOCK, director and general manager of the West Hunwick Silica & Firebrick Company, Limited, of Hunwick (Co. Durham), has died at the age of 67. He joined the company 16 years ago.

Former managing director of Pickersgill & Frost, Limited, ironfounders, and manufacturers of solid fuel cooking and heating appliances, of Langley Hill (Derbyshire), Mr. J. A. FROST died recently at the age of 92.

Mr. HORACE W. POCHIN, chairman of the Standard Engineering Company, Limited, boot and shoe machinery manufacturers, etc., of Leicester, and its associated companies, and a director of the Croft Granite Brick & Concrete Company, Limited, died recently at the age of 58.

General secretary, since 1949, of the Union of Shop, Distributive and Allied Workers, Sir JOHN ALAN BIRCH has died at the age of 51. He was knighted in this year's Birthday Honours. In 1958 he became a part-time member of the National Coal Board, and was reappointed in June this year.

The death has taken place of Mr. JAMES M. STEWART, for 51 years with Newton, Chambers & Company, Limited, near Thorncliffe, Sheffield. He was 64 and due to retire next July. He was successively confidential clerk and assistant to Mr. Gerald Allott, first general sales manager at the ironworks, Mr. G. G. Ibbotson, general manager and local director, and in recent years, to Mr. S. B. Rippon, engineering division general sales manager.

No Slump or Severe Recession in Steel

ALTHOUGH new business becoming available to the steel industry is not particularly impressive, says Quality, the journal of the Sheffield Chamber of Commerce, it would be wrong to jump to conclusions and regard the situation as anything like one of slump or severe recession. Rather, the indications point to a running down of stocks by consumers, which is causing the industry to be less busy in a period when steel-consuming industries are generally quite busy.

The journal points out that a "stop-and-go" demand is by no means helpful to an industry which has to carry a large amount of expensive capital equipment needing to be regularly employed for the industry to remain economically balanced. It is also stated that there is no indication that steel prices will do anything other than increase, having in mind the continued upward trend of costs.

DORMAN LONG PROFITS DECLINE

GROUP profits of Dorman, Long & Company, Limited, in the year ended September 30, 1961, declined from £8,286,757 to £7,333,084, and after taxation of £3,582,402 (£4,475,540) there is a net profit of £2,463,144 (£2,626,297).

The dividend is repeated at 10 per cent. with a final of 6½ per cent. Shareholders are told that trading conditions have deteriorated markedly since the middle of the calendar year 1961.

IRON AND STEEL TRADE

IT would be pleasant to be able to record some message of cheer in this pre-Christmas report but neither management nor men are optimistic about the immediate future. There is unanimity in the belief that there will be no sudden or dramatic recovery. Redundancies are more apparent at the primary stage of operations where large stocks of ingots have accumulated and many firms are compelled to cut down severely on iron and steel making until the consumption at the finishing end begins to rise.

Pig-iron

During the holiday deliveries of raw materials are likely to be suspended entirely as stocks of pig-iron, scrap, coke, etc., are adequate for resumption of work and, in any case, there is no difficulty in getting prompt delivery.

Stocks of pig-iron at the furnaces are more than sufficient to satisfy current demand.

Ferro-alloys

The demand for most items remains fairly constant. Ferro-tungsten is again unchanged in price and shows no improvement in demand. Reasonable attention is given to ferro-silicon and there is a steady demand for calcium silicide and ferro-manganese.

The position regarding ferro-chrome shows no change, while more specialized interest in supplies of ferro-phosphorus and ferro-sulphide is maintained. Ferro-titanium is quiet, but ferro-niobium appears to be of slightly more interest again. There is a fair request for ferro-vanadium and ferro-molybdenum.

Semi-finished Steel

The Christmas holiday at the re-rollers begins today (Friday) and many of them will be closed for the whole of next week. This will afford an opportunity for carrying out essential repairs and overhauls.

Orders are very scarce, particularly for small bars, light sections, and strip. Reinforcing rods are in fairly good demand, but the call is on a much lower level than hitherto. All grades of steel semis are available from home steelworks in tonnages much in excess of the demand, and mild steel semis in particular are very plentiful. Difficulty is also now being experienced by the steelworks in disposing of all arisings of defectives and crops.

Finished Steel

As is usual for this time of year, many consumers have embarked on stocktaking and the demand has therefore fallen away considerably. The overall position remains much the same with the steelworks all out to maintain production as high as depleted order-books will permit. There is no difficulty in accommodating specifications in current and forward rolling programmes.

Constructional engineers are also affected by lack of forward ordering and have to offer very short delivery dates in order to secure business. Colliery demands are still meagre and reduced even further by efforts to keep stocks as low as possible.

GLOUCESTER RAILWAY CARRIAGE & WAGON COMPANY, LIMITED—Acceptances of the Winget, Limited, offer have been received by substantially over 50 per cent. of holders of the ordinary stock of Gloucester Wagon. The directors of Winget state that the offer remains open for acceptance until further notice, but the offer, by Lazard Bros. & Company, Limited, to purchase for cash at par the convertible loan stock is closed.

Gas List Steel Tube Prices

THE Iron and Steel Board announces that consequent upon the increase in the price of hot rolled carbon steel strip on November 6, 1961, the price of gas list steel tubes and tubulars sold in the United Kingdom will be increased by approximately 2 per cent. from January 1, 1962.

In 1960 about 300,000 tons of gas list tubes were sold on the home market and about 180,000 tons were exported. Gas list tubes are used to convey gas, water, and steam and they range in size from ¼ in. to 6 in. in diameter. The term "tubulars" is applied to short pieces of rolled steel tubes under 2 ft. in length.

Large Shearing Machine for Scrap Processors

LARGEST shearing machine of its kind to be installed in a scrap yard in this country has been imported from Germany, by T. J. Thomson & Son, Limited, scrap processors, of Stockton-on-Tees.

When assembled the machine measures 67 ft. long, 25 ft. high, and 27 ft. wide, and weighs 128 tons. It has a cutting force of 560 tons and is capable of shearing steel plate 2¼ in. thick by 5 ft. wide. It is being carried by British Railways from Harwich to the company's Stockton-on-Tees sidings.

JOHN THOMPSON DELIVERS 10,000th BOILER

DELIVERY of the 10,000th shell boiler constructed at the Ettingshall (Staffs) works of John Thompson (Wolverhampton), Limited, was made to Rolls-Royce, Limited, in Derby, on Thursday of last week. The boiler is to be installed in the new engineering block of the aero division of Rolls-Royce, and will supply central heating and power.

Sir Edward Thompson, chairman, and Mr. J. H. N. Thompson, joint managing director, attended the formal handing-over ceremony, and Sir Edward recalled that the firm has been making boilers for 140 years, since his great-grandfather founded the company.

HOLMAN BROS., LIMITED, manufacturers of mining and quarrying equipment, iron, steel, and brass-founders, etc., of Camborne (Cornwall)—Interim dividend for the year ending March 31, 1962, is being cut to 3 (4) per cent. Mr. P. M. Holman, the chairman, in his annual review, indicates that the current year's sales volume is disappointing and the outlook for the remainder of the year is not optimistic. Measures taken to cut costs are unlikely to benefit substantially the 1961-62 trading results.

Board Changes

Chairman of Kayser Ellison Retires

CHAIRMAN of KAYSER, ELLISON & COMPANY, LIMITED, steel manufacturers, of Sheffield, Mr. L. A. K. Halcomb is to retire after 52 years with the company. He will be succeeded by Mr. J. R. A. Bull, managing director. Mr. Halcomb, who will remain on the board of Sanderson Kayser, Limited, the holding company, joined Kayser Ellison in 1910 and after the first world war specialized on the wire side, being director in charge of the wire department from 1922 until 1951.

He was appointed a director in 1919, assistant managing director in 1928, and deputy chairman and joint managing director in 1941. He became chairman and joint managing director in 1946, and chairman and managing director in 1957. He relinquished the post of managing director in 1960.

MR. S. SHEPHERD-SMITH

Managing director of Austin Hoy & Company, Limited, mining machinery manufacturers, of High Wycombe (Bucks), Mr. S. Shepherd-Smith will join the board of the parent company, MAVOR & COULSON, LIMITED, conveyor and coal cutter manufacturers, of Glasgow, on January 1.

Mr. Shepherd-Smith is also a director of Darnall Industries, Limited, belt fastening machine makers, of Sheffield, and managing director of London Sales & Service, Limited.

FLUIDRIVE ENGINEERING COMPANY, LIMITED—Mr. John Raymond has joined the board.

YALE & TOWNE MANUFACTURING COMPANY—Mr. W. Atkinson Adam has been appointed managing director of the company's three British divisions.

E. SHIPTON & COMPANY (HOLDINGS), LIMITED—Mr. Edward Shipton has resigned as a director and vice-chairman. He was the founder of the company.

CONTROLLED HEAT & AIR, LIMITED—Mr. A. Derbyshire has been appointed managing director of the company, a member of the Incandescent Heat Company, Limited, group, in succession to the late Mr. R. D. MacMillan.

EDMUNDS WALKER & COMPANY, LIMITED—Mr. J. R. Storar, a director, has been appointed chairman, and Mr. T. E. Walker, managing director, has become deputy chairman and managing director. The changes follow the death of Brig. S. K. Thorburn.

TURTON BROS. & MATTHEWS, LIMITED—Mr. J. H. Jubb, manager of the Neepsend works, will retire on December 31 after 60 years' service with the firm. He will continue as a director of the company, and of its subsidiary, J. P. Skinner & Company, Limited.

TIMKEN ROLLER BEARING COMPANY, LIMITED—Mr. E. R. Knapp has been appointed assistant managing director of the British Timken division. He was formerly assistant chief engineer in the division, and latterly has been assistant to the managing director.

Durham NCB Chief on Extra Safety Efforts

ANNOUNCING that the fatal accident rate so far this year in the Durham Divisional Coal Board was the lowest ever for any comparable period, Dr. W. Reid, chairman of the Division, stressed that there was no room for complacency. "Our task is to intensify our efforts, to minimize unsafe conditions, and eliminate unsafe actions by individuals. Practical action at the pit is the keynote of Durham's Greater Safety Campaign," he said.

In his second major address on safety to be held within a week, Dr. Reid was speaking to representatives of the Divisional Coal Board, the executive of the Durham Area, National Union of Mineworkers, the National Association of Colliery Managers, and Colliery Consultative Committees. Mr. Sam Watson, secretary of the Durham Area, NUM, presided at the conference in Durham.

In a specially recorded message, Lord Robens, chairman of the National Coal Board, congratulated Durham miners on their determined safety efforts, and called for a "sustained year by year improvement in the safety record of the industry."

Single Shifting Delayed at Dean and Chapter

AS a result of representations by the Durham County Mining Federation Board, there is some amelioration in the original proposals which involved the Dean & Chapter Combined Mine, Ferryhill, going on to single shifting by June, 1962, with a reduction of the present manpower by nearly a half. Single shifting will now be delayed until not later than June, 1963, and the number of men to be declared redundant will be reduced by one fifth. Alternative jobs at nearby collieries, or in other divisions, will be offered.

The proposals were explained at a special meeting of the Colliery Consultative Committee held at Dean & Chapter Colliery last Friday, and attended by representatives of the National Union of Mineworkers. Similar meetings will be held at the Chilton and Leasingthorne units of the combined mine.

Belgian Coal Market to be "Isolated" for Further Year

THE "isolation" of the Belgian coal market is to be extended for a year, it was decided at a meeting of the Council of Ministers of the European Coal and Steel Community in Luxembourg recently. The present "isolation," which excuses Belgium from opening up its coal trade to other member countries, was introduced to overcome structural problems in the Belgian industry. The High Authority of the ECSC is expected to approve the council's recommendation.

It was also agreed that the High Authority should make loans totalling over 100,000,000 fcs. for reconversion projects in Liège, where there is unemployment in the coal industry. Three factories are to be set up, creating 3,000 new jobs, 10 per cent. of which will be filled by former mineworkers.

Mr. J. A. CHAPMAN has been appointed district representative for the southern area by Shawnee Poole, Limited, manufacturers of tractor haulage equipment.

Company News

SCOW PROFITS DOWN

Fall in Sales of £10,000,000

SALES and other income of the Steel Company of Wales, Limited (SCOW), fell by £10,000,000 to £133,000,000 in the year ended September 30, 1961, and the final dividend is cut from 1s. 6d. to 1s. per £1 ordinary share, making a total of 2s. (2s. 6d.) per share. The trading surplus declined from £30,480,000 to £23,250,000, and after depreciation of £8,333,234 (£8,217,131), taxation of £3,100,000 (£7,400,000), and other charges, the net profit is down from £7,030,000 to £4,930,000.

The company tells shareholders that the recession in demand for sheet and tinplate continued during the second half-year. The export market became much more competitive and prices were reduced. Increased costs were not recouped adequately in the home market.

As previously reported, Mr. Harald Peake, chairman of SCOW, will be succeeded by Sir Julian Pode after the annual meeting in February.

STEPHENSON CLARKE, LIMITED—The £2,100 capital of J. B. Couper, Limited, Glasgow shipbrokers, has been acquired.

DUPORT, LIMITED—Unless trading conditions begin to improve in the relatively near future, it may be necessary to reduce the ordinary dividend for 1961-62, says Mr. W. L. Barrows, chairman.

SUTCLIFFE SPEAKMAN & COMPANY, LIMITED, manufacturers of briquetting machines, filtration and ventilation plants, etc., of Leigh (Lancs)—The company is increasing its interim payment—from 5 per cent. to 7½ per cent.—in order to reduce the disparity.

MINWORTH METALS, LIMITED—There was an increase in overall trading and a record trading profit for the year of £191,632, but increased profits tax prevented a dividend of more than 30 per cent. being recommended, said Sir John Fox, the chairman, in his annual report.

WESTINGHOUSE BRAKE & SIGNAL COMPANY, LIMITED—Group trading profits fell to £1,747,032 (£2,394,819) for the year to September 30, 1961, and the dividend is cut to 9 (11) per cent. After heavier interest charges and a substantially reduced tax provision, net profit is £782,979 (£1,119,893).

DEWHURST & PARTNER, LIMITED, manufacturers of electric control equipment, of Hounslow (Middx)—Final dividend is declared at 7½ per cent. on capital doubled by a scrip issue, making the equivalent of 10½ per cent. for the year ended September 30, 1961, against 10 per cent. previously.

UNIVERSAL GRINDING WHEEL COMPANY, LIMITED—With a final tax-free dividend of 12½ per cent., total for the year ended September 30, 1961, is 20 (same) per cent. on the ordinary and employees' stock. Net profit attributable to the parent company is £567,770 (£600,372), after tax of £627,645 (£646,281).

WRIGHTS' ROPES, LIMITED—Expressing hopes of an improvement in operating conditions, Mr. G. J. W. TURNER, the chairman, adds that the immediate prospects "are not very encouraging." Maintenance of a reasonable return depended on increased productivity and reduced costs, rather than on increased selling prices.

JOHN WILLIAMS (WISHAW), LIMITED, steel re-rollers, of Wishaw (Lanarkshire)—The company, a member of the Thos. W. Ward, Limited, group, has acquired the entire share capital of James Shortland & Company, Limited, manufacturers of nails, etc., of Wishaw. Mr. W. Hall, of John Williams, has succeeded Mr. W. A. Shortland as chairman, and Mr. Adam Parkin has been appointed director and secretary.

SKEFKO BALL BEARING COMPANY, LIMITED—Subject to the necessary Exchange Control consent to participation by the parent company, Aktiebolaget Svenska Kullagerfabriken (SKF), it is proposed to raise £1,600,000 by a rights issue early in the New Year. The proposal also depends on market conditions at the time being "not markedly different." The intended issue of 500,000 £1 shares at 65s. each on a one-for-12 basis.

GASKELL & CHAMBERS, LIMITED, engineers, coppersmiths and brassfounders, etc., of Birmingham—It is proposed to change the name of the company to Gaskell & Chambers (Holdings), Limited, and to transfer the existing trading operations of the company to two wholly-owned subsidiaries to be formed. It is also proposed to increase the authorized capital to £1,000,000 by the creation of 2,400,000 unclassified shares of 5s. each.

FALKS, LIMITED—The Wandleside Warren Wire Company, Limited, Dunmurry (N. Ireland), is now a wholly-owned subsidiary of the group. Mr. and Mrs. J. R. Cook are no longer members of the board of the company, which was previously 51 per cent. American. The technical aid agreement with the American companies has been both widened and lengthened. There is also the right of self-inspection of these factories, it is stated.

SWAN, HUNTER, & WIGHAM RICHARDSON, LIMITED—The company has acquired for cash the entire issued share capital of £16,550 of Brims & Company, Limited, civil engineering contractors, of Newcastle-upon-Tyne, which thus becomes a wholly-owned subsidiary. Object of the acquisition is to provide a measure of diversification for the Swan Hunter group by an investment in civil engineering and to provide additional facilities for the further expansion of Brims' activities.

LEEDS FIRECLAY COMPANY, LIMITED—As expected, there was a considerable improvement in sales of conventional refractories for most of the past year. A further improvement of 29 per cent. was recorded for specialties, says the mhairman, Lt.-Col. R. B. Leech, in his annual report. The company has now established a leading position in the application of these materials in the construction and repair of furnace linings for the ironmaking industry, he adds.

ELLIOTT BROS. (LONDON), LIMITED, electrical and mechanical engineers, and manufacturers of automation

systems, of London, S.E.13—The company has acquired for cash the capital of Palatine (Surbiton), Limited, industrial atomic energy engineers, which has for some time been a supplier to companies in the Elliott-Automation, Limited, group, chiefly the Rotameter Manufacturing Company, Limited, and Elliott Nucleonics, Limited. Mr. H. G. S. Rogers, director of Rotameter, and Mr. J. C. Nutter, director of Elliott Nucleonics, will join the existing board of Palatine.

ADAMANT & WESTERN ENGINEERING COMPANY, LIMITED, engineers, of Luton (Beds)—The company has acquired 44,000 ordinary £1 shares in Rawlings Manufacturing Company, Limited, manufacturers of diecastings, etc., of London, S.W.12, out of 65,000 shares in issue. The purchase consideration of £80,850, in which nothing is included for goodwill, has been satisfied by the allotment of 115,500 Adamant ordinary 5s. shares ranking *pari passu* with the existing ordinary. Mr. F. V. Waller, of Adamant, has been appointed chairman of the Rawlings board, from which Mr. Robert Braid, Mr. Albert Braid, and Mr. G. S. Haigh have resigned.

Cleveland Bridge & Engineering Raises Dividends

TRADING profit of £142,821 was made in the year to September 30, 1961, by the Cleveland Bridge & Engineering Company, Limited, Darlington, and after taxation of £45,750, a net profit of £97,071 remains. Recommending an increased dividend, the directors state that future dividends, including the final for the year, will be stated at the gross rate before deducting income tax, instead of at a rate free of income tax as before.

Final dividend is declared at 9.55 per cent., making with the interim of 1½ per cent. free of tax (equivalent to 2.45 per cent. gross) a total for the year of 12 per cent., against 10.61 per cent. previously.

Working Party Formed to Assess Shipyard Productivity

UNDER the chairmanship of Mr. P. H. St. John Wilson, deputy secretary, Ministry of Labour, union leaders and employers in the shipbuilding industry have agreed to set up a joint working party to find ways of improving industrial relations and competitive ability. The decision was made on Thursday of last week between representatives of the Shipbuilding Employers' Federation, the Confederation of Shipbuilding and Engineering Unions, and Mr. John Hare, the Minister of Labour.

The joint working party, which will meet soon and report back to the employers and union leaders, will include five members from each side of the industry.

THOMAS BLACK, LIMITED—The following appointments have been made to the boards of companies in the group:—Thomas Black, Limited: Mr. F. J. R. Boddy and Mr. R. N. Horne: Industrial Plant (Combustion), Limited: Mr. A. F. Hartley, and Mr. C. A. Standley; Ridge Limestone, Limited: Mr. F. J. R. Boddy, Mr. J. G. Campbell, Mr. G. Chegwen, Mr. A. F. Hartley, and Mr. F. Scampton; Withers Limestone, Limited: Mr. F. J. R. Boddy, Mr. A. F. Hartley, Mr. R. Horswill, and Mr. F. Scampton; Holme Park Lime, Limited: Mr. A. F. Hartley, Mr. R. Horswill, and Mr. F. Scampton.

Appointments

George Kent Appoints Marketing Manager

MANUFACTURERS of automatic control and industrial instruments, George Kent, Limited, Luton (Beds), has appointed Mr. R. C. INGRAM to the newly-created post of marketing manager. Joining the company in 1934 as a student apprentice, Mr. Ingram became a service engineer in North-east England, and was later appointed manager of the first nuclear section of production control.

MR. R. C. INGRAM

The company has also made the following appointments to its area sales staff:—Mr. K. A. STEELE (outer London), Mr. J. C. BARRETT (Surrey, Kent and Sussex), Mr. G. H. C. LYNN and Mr. J. E. BROWN (Birmingham), Mr. D. E. HARVEY (Manchester), and Mr. R. BARCLAY and Mr. MILLAR TAYLOR (Scotland). The company provided the instrumentation for Harwell's first large-scale reactor.

Mr. H. RUSS has been appointed representative covering Lancashire (except Liverpool), Cheshire, Cumberland, and Westmorland, for John Peace (Steel & Tools), Limited, hand tool manufacturers, of Sheffield.

Mr. R. J. SURY has been appointed lecturer in the Department of Engineering Production, University of Birmingham, from January 1. Mr. E. J. HUGHES has been appointed Research Fellow in the Department of Physical Metallurgy from October 1, 1961.

At present manager-designate of the rod and bar mill at the Scunthorpe (Lincs), works of Appleby-Frodingham Steel Company, branch of the United Steel Companies, Limited, Mr. E. A. HANSELMAN becomes manager of the department on January 1.

Appointed consultant architect by Turner & Newall, Limited, manufacturers of asbestos products, of Manchester, Mr. E. D. JEFFERISS MATHEWS will advise the company on all matters relating to design and application of products for use in the building industry.

Mr. T. V. KELLY, blast-furnace manager at Staveley Iron and Chemical Company, Limited, since 1957, has been appointed iron plant manager for the Rhodesian Iron & Steel Company, Limited. Both companies are members of the Stewarts and Lloyds, Limited, group.

Mr. A. COLE, who has joined the mining department of G.E.C. (Engineering), Limited, at the company's Fraser & Chalmers Works, Erith (Kent), will maintain contact with mining companies and will supervise the commissioning of GEC mining plants in this country and oversea.

Mr. F. C. WALMSLEY is joining British Insulated Callender's Cables, Limited, on January 1 as assistant divisional manager, capacitor division. He leaves the Micanite & Insulators Company, Limited, where for several years he has been responsible for engineering activities in the high voltage bushing and insulator fields.

Firedamp Drainage in Mines

Part 2.—Practical Benefits

*by I. H. MORRIS, Ph.D., M.Sc.**

The practical benefits to be gained from methane drainage are fully discussed in the second part of this paper, which was presented to the Yorkshire Branch of the National Association of Colliery Managers on January 12, 1960. In our last issue the author described the factors leading to concentrations of firedamp in mines and outlined the development of firedamp drainage techniques in Yorkshire. Part 2, which concludes the paper, also outlines a method of assessing the effects of firedamp drainage by comparing "percentage capture values."

IN recent years, particular attention has been focused on the application of firedamp drainage to the improvement of ventilation conditions at the coal face itself.

An examination of the results of drainage in a large number of gates in different seams and in different conditions indicates that an assessment of the overall effects of individual firedamp drainage installations does not necessarily provide an adequate general model. Some effects, such as reduction in general body methane concentrations in return gates, are universal, while other possible accomplishments such as reduction in methane concentrations in intake gates, at waste edges, in wastes, and at ripping lips, are closely related to particular coal face and seam conditions.

For comparison purposes, districts in which firedamp drainage has been applied can be grouped broadly as follows, according to conditions existing before, and the changes which can be anticipated after, the introduction of drainage.

(*a*) Districts with low methane inflow rates in the intake gate and at the coal face, but with comparatively high methane inflows at the return ripping lip and further outbye in the return gate.

(*b*) Districts with comparatively high, or high methane inflow rates at coal faces, at waste edges and in wastes, at the return ripping lip and in the return gate.

(*c*) Districts with comparatively high methane yield rates in the intake gate, at the intake ripping lip, at the coal face, in wastes, at the return ripping lip and in the return gate.

(*d*) Districts with comparatively high methane yield rates in the intake gate and intake ripping lip, but modest or low methane inflow rates from wastes, return ripping lip and return gate.

(*e*) Districts with negligible methane inflow rates in the intake gate and intake ripping lip, substantial methane inflow rates at the coal face itself and in wastes, but with modest methane inflow rates in the return gate.

* Ventilation engineer, North-Eastern Divisional Coal Board.

For group (*a*) districts, boreholes drilled from the return gate invariably produce the desired effects, mainly in the form of reduction in methane concentrations in the last wastes, at the return ripping lips, and in the return gates. The effect of firedamp drainage on methane concentrations at waste edges and in wastes is small because methane concentrations at those positions are low originally.

Cases of this type have been encountered in the Barnsley, Haighmoor, Parkgate, Silkstone, and Beeston seams.

In districts belonging to group (*b*), low-angled upward holes drilled parallel to the line of face bring about marked reductions in methane concentrations at the coal face, in wastes and at waste edges, at the return ripping lip and in the return gates. Cases of this type are met in the Barnsley and Thorncliffe seams.

For districts in group (*c*), low-angled upward holes from the return gate usually suffice to bring about the desired improvements in methane concentrations in the intake gate, at the intake ripping lip, at the coal face, in wastes, at the return ripping lip and in the return gates in the absence of faults at the coal face. Cases of this type have been met in the Parkgate Seam. Drilling upward holes in an intake gate may be necessary in addition to those from the return gate.

Problems in districts belonging to group (*d*) can be solved by boring low-angled boreholes from the return gate, provided no geological disturbances exist and strata are comparatively strong. In these cases, significant improvements have been obtained in methane concentrations at intake ripping lips and intake gates, at the coal face and in the return gate. Cases of this type have been dealt with in the Fenton and Parkgate seams.

Districts belonging to group (*e*) are exceptional and are associated with a number of gas feeders at the coal face itself. To deal with this type of problem, upward holes may be necessary in intake

and return gates. One example has been experienced in the Barnsley Seam, where application of firedamp drainage led to substantial reductions in methane concentrations at and around the coal face itself.

Criteria for Assessment

To assess the principal effects of firedamp drainage on ventilation factors, bases of comparison are necessary. For instance, methane concentrations at certain positions in a ventilating district (such as at statutory sampling points, at waste edges, in wastes, at outbye end of district, and others) can be compared before and after the introduction of firedamp drainage.

In addition to this detailed information, however, a broader measure of comparison is required so that results from different gates in the same seam and from different installations can be assessed. The total methane rate of extraction per gate in itself is not a satisfactory basis of comparison because the total methane flow rate in districts in which the firedamp drainage is undertaken may vary from 15 to about 600 cu. ft./min. One useful practical basis of comparison is the "percentage capture" value. This figure gives, as a percentage, the ratio of volume rate of methane extracted in the gas main to the total volume of methane flowing in the district—the latter comprising the sum of the methane in the ventilating current at the outbye end of the district and the methane flowing in the gas main. Comparison of "percentage capture" figures are made on a rib side or gob side gate basis, since the former can be significantly higher than the latter. "Percentage capture" values, borehole performance figures, and general body details, however, do not provide sufficient detailed information on ventilation conditions in the districts.

Other criteria are employed for control of an installation. Such criteria include number and length of boreholes required to produce certain results, cost of bits, cost per foot of drilling boreholes, cost of machine replacements, cost of other consumable materials, and number of gates used to extract a certain total methane flow rate. It is proposed to limit consideration to selected topics dealing with the effect of firedamp drainage on methane distributions and allied matters.

Percentage Capture

The percentage capture in a ventilating district in which firedamp drainage with pump suction is established varies from about 30 to 85 per cent., that is, the quantity of methane collected in the pipe system varies from 30 to 85 cu. ft./min./100 cu. ft./min. total methane make in a ventilating district. Experience shows that, in general, about 55 per cent. of the total methane make can be collected in a gas main system without much difficulty.

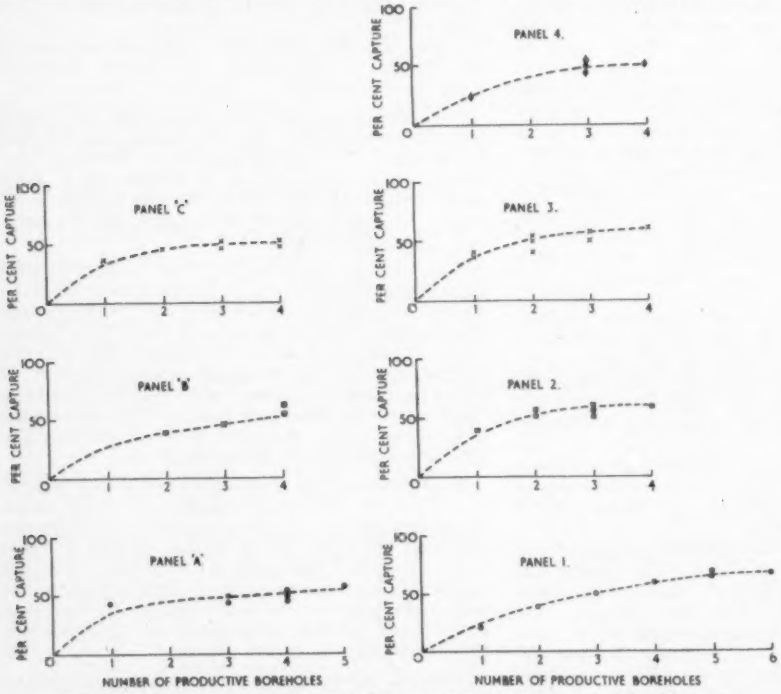


FIG. 8.—RELATIONSHIP BETWEEN PERCENTAGE CAPTURE AND THE NUMBER OF BOREHOLES.

In thick seams, such as the Parkgate and Barnsley, however, evidence is becoming available which suggests that, only when the percentage capture approaches or exceeds 60, are conditions likely to be produced where intake gate, coal face, waste edge, waste, ripping lip, and return gate methane concentrations can be reduced to the required values. It is known also that a 50 per cent. capture in a ventilating district does not neces-

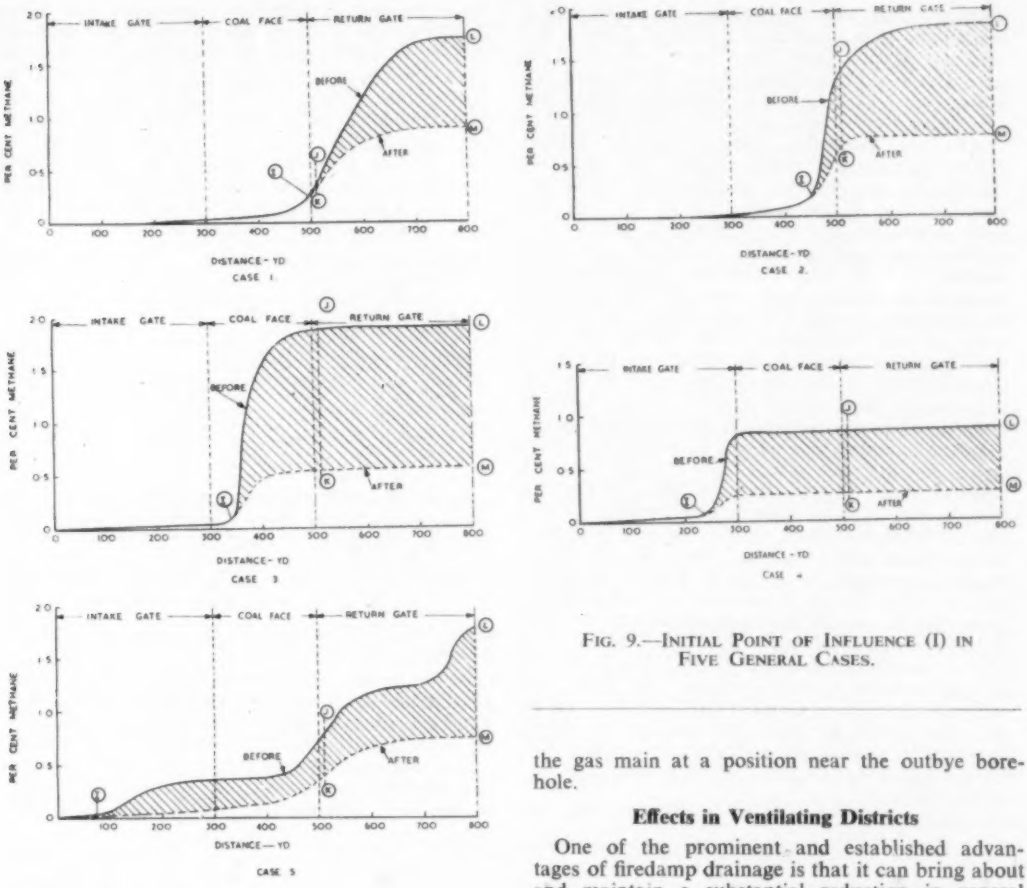


FIG. 9.—INITIAL POINT OF INFLUENCE (I) IN FIVE GENERAL CASES.

sarily bring about the significant reductions in methane concentrations at waste edges and in wastes in some seams and on some coal faces where high methane concentrations exist before the introduction of firedamp drainage.

An examination of firedamp drainage results in the Barnsley, Parkgate, and other seams shows that percentage capture is generally a function of the number of boreholes and applied suction in an established system and that a large number of productive boreholes does not necessarily increase percentage capture values. Typical examples are presented in Fig. 8 which shows the variation in percentage capture with number of productive boreholes in individual gates over a period of time.

In many gates, the maximum percentage capture occurs when four boreholes are productive. For a maximum capture of 52 per cent. with four productive boreholes, for instance, the mean percentage captures with one, two, and three boreholes were, respectively, about 37, 44, and 48 per cent. with a constant suction of about 1 in. mercury in the gas main at a position near the outbye borehole.

Effects in Ventilating Districts

One of the prominent and established advantages of firedamp drainage is that it can bring about and maintain a substantial reduction in general body methane concentrations in a ventilating district when applied systematically. Significant reductions have been obtained in districts with total methane inflow rates ranging from about 100 to over 550 cu. ft./min. It follows, therefore, that methane concentrations at the return ripping lip and at the outbye end of a return gate can be reduced to about half the pre-drainage values without change in air flow rate in nearly all cases.

In some instances, however, the return ripping lip and outbye end samples in the return gates have been reduced to about one fifth of the original value, equivalent approximately to a percentage capture of 80.

The initial point of influence of firedamp drainage on general body methane concentrations (point I in Fig. 9) varies from installation to installation and depends on the type of methane build-up in a district. The initial point of influence has varied from a position about 200 yd. outbye the intake ripping lip (in case 5, Fig. 9) to a position at the return ripping lip itself as in case 1, Fig. 9. In a

district where methane inflows are significant in an intake gate (outbye the intake ripping lip), methane concentrations have been reduced in that gate and at positions downstream at the coal face and in return gates in ventilating districts comprising coal faces with lengths up to about 230 yd. Similar results are obtainable when significant methane inflow rates exist at intake ripping lips. In nearly all installations, methane concentrations have also been reduced at the return end of the coal face itself (upstream the return gate-side pack).

The illustrations presented in Fig. 9 give a broad indication of the range of benefits which have been realized on general body methane concentrations by firedamp drainage. In each illustration, I is the point of initial influence, J and K the "before" and "after" readings at the 10-yd. statutory sampling positions in the return gate, and L and M, respectively, the "before" and "after" observations taken at the outbye end of the return gates.

It will be noted that point I occurs at the return end of the coal face in case 1, at the coal face at a position about 50 yd. from the return end of the face in case 2, at the coal face at a position about 150 yd. from the return end of the face in case 3, in the intake gate at a point about 60 yd. outbye the intake ripping lip in case 4, and in the intake gate at about 200 yd. outbye of the intake ripping lip in case 5. An indication of the benefits attained in 10 ventilating districts is given in Table 3.

The reductions obtained at the return end of the coal faces, at the return ripping lips, and at the outbye end of the return gates are shown to be of the order of 50 per cent., or significantly larger. The benefits attained on methane concentrations in the general body on the coal face itself are discussed below

In some districts in which firedamp drainage has been introduced, ventilation problems had arisen (prior to the introduction of drainage) with the quality of air entering the coal face and methane concentrations at the intake ripping lip. With the application of firedamp drainage a number of such problems have been solved even though firedamp drainage was practised in return gate roadways 100 and 200 yd. from the intake gates. Such results have been obtained in ventilating districts with air quantities ranging from 7,500 to 20,000 cu. ft./min. Two examples are cited in Table 4.

TABLE 4.—*Effect of Firedamp Drainage in Two Intake Gates.*

Air flow rate.	Methane concentrations outbye intake ripping lip.		Relevant condition.
	50 yd.	10 yd.	
Cu. ft./min.			
12,500	0.25	0.25	Before
	0.05	0.05	After
20,000	0.20	0.25/0.40	Before
	0.10	0.10	After

It is becoming evident, however, that not all problems in intake gates and intake ripping lips will be solved by drilling boreholes from return gate roadways. In the presence of weak strata, or faults, rolls, washouts and similar disturbances, it may not be possible to achieve the desired results from the return gate. In such cases, it may be necessary to drill holes from the intake gate.

In most cases, the effect of firedamp drainage on general body methane concentrations on the intake side of a coal face has been small. The influence on general body methane concentrations on the return side of a coal face, however, can be significant reductions ranging from 0.25 to 1.0 per cent. having been obtained in coal face air flow rates

TABLE 3.—*Effect of Firedamp Drainage on General Body Methane Concentrations.*

Seam.	Air flow.	Methane concentrations.				Relevant condition.
		Intake ripping lip.	Return end of face.	Return ripping lip	Outbye end of gate.	
Barnsley	Cu. ft./min. 7,500	Per cent. —	Per cent. 0.80	Per cent. 1.25	Per cent. 1.90	Before
		—	0.55	0.65	0.65	After
Barnsley	13,500	—	1.45	1.55	1.80	Before
		—	0.70	0.80	0.80	After
Barnsley	15,000	—	0.80	0.90	1.65	Before
		—	0.30	0.40	0.65	After
Barnsley	18,000	—	0.70	0.90	1.60	Before
		—	0.60	0.65	0.65	After
Barnsley	18,000	—	1.45	1.50	1.80	Before
		—	0.45	0.50	0.55	After
Haighmoor	10,000	—	0.60	0.75	1.90	Before
		—	0.40	0.45	0.85	After
Parkgate	12,500	0.20	0.50	1.00	1.80	Before
		0.05	0.35	0.50	0.90	After
Parkgate	20,000	0.25	0.70	1.00	1.10	Before
		0.10	0.55	0.60	0.65	After
Thorncliffe	7,000	—	0.40	0.60	1.65	Before
		—	0.20	0.30	0.45	After
Beeston	21,000	0.20	0.30	0.50	0.65	Before
		—	0.20	0.25	0.25	After

ranging from 6,000 to 20,000 cu. ft./min. Reductions in general body methane concentrations of the order of 0.10 to 0.25 per cent. in air flow rates of 6,000 to 12,000 cu. ft./min. are fairly common at the return end of a coal face. Examples of the effect of firedamp drainage on coal face general body samples are given in Table 5.

TABLE 5.—*Effect of Firedamp Drainage on Methane Concentrations at Four Coal Faces.*

Reference.	Air flow.	Methane concentrations at coal face at selected positions.					Relevant condition.
		Intake end.	¼ dist.	½ dist.	¾ dist.	Return end.	
	Cu. ft./mm.						
A	13,500	Nil	0.25	0.50	1.00	1.45	Before
		Nil	0.25	0.35	0.55	0.70	After
B	18,000	Nil	Nil	0.30	1.00	1.45	Before
		Nil	Nil	0.05	0.25	0.50	After
C	12,500	0.25	0.25	0.30	0.45	0.75	Before
		0.05	0.10	0.15	0.20	0.25	After
D	20,000	0.30	0.30	0.40	0.55	0.70	Before
		0.10	0.30	0.35	0.50	0.50	After

Where methane inflow on the coal face is small originally, it follows that the effect of firedamp drainage on general body methane concentrations will be limited. In most cases, the coal faces belong to group (A) above, and the reductions in methane concentrations at the return end of the coal face itself are only of the order of 0.1 per cent. Examples of this type have been found in the Barnsley, Parkgate, Haighmoor, and Silkstone seams. A number of caved faces belong to this group.

As yet, there is insufficient information of the established standard to show clearly the effect of firedamp drainage on the additional methane released in a ventilating district during coal cutting operations. Results suggest that benefits from firedamp drainage will be limited.

In moderately gassy and gassy seams, methane concentrations at waste edges of strip packed coal faces working on a 24-hr. or short repetitive cycles generally increase after the second or third wastes (from the intake gate pack side) to the last waste adjacent to the return gateside pack. Methane gradients, however, vary from seam to seam and from face to face, and evidently depend upon the sample position chosen. In particular, waste edges and wastes near the return side of the coal face may prove difficult due to the presence of comparatively high methane concentrations. With drainage, on the other hand, waste-edge methane concentrations on strip packed, caved, and solid stowed faces can be reduced to values similar to those in the ventilating stream on the coal face.

Strip-packed Faces

An examination of numerous observations taken by ventilation engineers on strip-packed coal faces in different seams prior to the introduction of firedamp drainage provides the following principal information for coal faces, other than those belonging to the first group mentioned above.

(*a*) Methane concentrations in wastes of gassy seams (other than the first, second or third waste from the intake gateside) usually increase progressively from the intake to return gate. On some coal faces, however, a substantial increase in methane concentrations occurs in the last two or three wastes from the return gateside pack.

(*b*) Other than the two or three wastes on the intake side mentioned in (*a*), each waste exhibits stratification of methane to some extent in that generally methane concentrations are higher at roof level, lower at mid-height and least at floor level in a waste.

(*c*) Stratification of methane usually becomes more pronounced up to depths of about 15 ft. into the waste.

(*d*) Methane concentrations at waste edges increase from the intake to the return side of the face, though the increase may not be regular.

(*e*) Variation in methane concentrations with height at individual waste edges is often small, but may be substantial in the last two or three wastes at the return end of the coal face.

(*f*) Methane concentrations at waste edges on the return side of the face (particularly at mid to roof height) are often significantly higher than concentrations in the ventilating stream passing those positions.

(*g*) Methane gradients near the waste edge (showing rise in methane concentration with distance into wastes) are smaller in faces advancing to the rise than those advancing on a level or to the dip, *i.e.*, higher methane concentrations exist at and near waste edges of coal faces advancing to the rise.

(*h*) Smoke tests often show a drift of gas from the intake to the return side of individual wastes, but such tests are sometimes inconclusive.

(*i*) In many cases, methane concentrations in individual wastes are least in the middle of a waste and highest at the pack sides.

(*j*) Except for the last two or three wastes, methane concentrations are frequently higher on the upstream (intake) side of a waste than on the downstream (or return) side of the same waste.

(*k*) Beyond the break line (often 4 to 6 ft. from the waste edge), methane concentrations gradually increase with height above seam thickness, but the increase is more rapid near the roof of a waste and at the return end of the face.

(*l*) At a given horizontal plane in a waste, methane concentrations increase with distance into that waste (to distances of about 20 ft.).

(*m*) Methane concentrations in wastes (particularly at the return end of a coal face) may increase with shorter work cycles, *i.e.*, methane concentrations in wastes in the same seam are generally smaller when coal faces are operated on a slow rate of advance than on a 24-hr. or shorter working cycle.

By the application of firedamp drainage to faces where comparatively high waste edge and waste methane concentrations exist, substantial reductions in methane concentrations can be obtained. Probably for the first time in the history of many

faces in the Barnsley Seam, for example, it is possible to realize and maintain methane concentrations from floor to roof at the waste edges (and for distances at least equivalent to two arms' lengths in the waste) at 0.5 per cent. methane or less throughout fully productive coal faces. Such results have been obtained on double-unit and single-unit coal faces with lengths up to about 230 yd. operating on 24-hr. or shorter working cycles.

An examination of a similar number of observations for strip packed coal faces where strata were fairly strong and on which firedamp drainage was applied, provided the information given below:—

(*a*) Methane concentrations at waste edges can be kept to 0.5 per cent. or less in a large number of cases where formerly concentrations were substantially higher, and of the order of 2 per cent.

(*b*) Though stratification exists in wastes other than the first, second and third from the intake gate, the amount of stratification is small. In most cases, the difference in methane concentrations from floor to roof at waste edges and up to about 9 ft. into the waste is less than 0.10 per cent.

(*c*) In most wastes, there is little variation in methane concentration across the waste edge (from pack side to pack side) at given horizons. A graph showing variation in methane concentrations across a waste almost invariably shows a horizontal line.

(*d*) In most wastes, little variation in methane concentrations occurs from the waste edge into the waste (for distance of 9 ft.) from floor level up to seam height. Small increases in methane concentration have been encountered at heights of about 12 ft. at a distance of 12 ft. into a waste, when samples have been taken against the roof of a waste behind the breaking off line. In many cases, no rise in methane concentrations has been detected from the waste edge to a distance of 20 ft. into wastes, that is, a methane fringe has not been detected in a waste within a distance of 20 ft. from the waste edge, and methane concentrations were of the order of, or less than, 0.5 per cent.

(*e*) The increase in methane concentration with height (above seam height) and beyond the break line in wastes is often small.

(*f*) Methane concentrations at waste edges along the coal face are almost the same as those in the ventilating stream passing those positions.

(*g*) The increase in methane concentrations at waste edges and in wastes along the face is small and therefore substantially smaller than it was prior to the introduction of firedamp drainage.

(*h*) The effect of drainage on methane concentrations in wastes near the intake gate is small because, in general cases, methane concentrations in those wastes before and after drainage are of the order of 0.05 to 0.10 per cent. Exceptions are known at descensionally ventilated faces.

(*i*) Reductions in methane concentrations at waste edges range from about one quarter to one tenth the original values.

(*j*) On most coal faces, marked reductions in methane concentrations are obtained in the last four wastes on the return side of long, single-unit faces (length about 200 yd.) between mid and roof heights over distances up to about 12 ft. into the waste. For the reason given in (*h*), reductions in

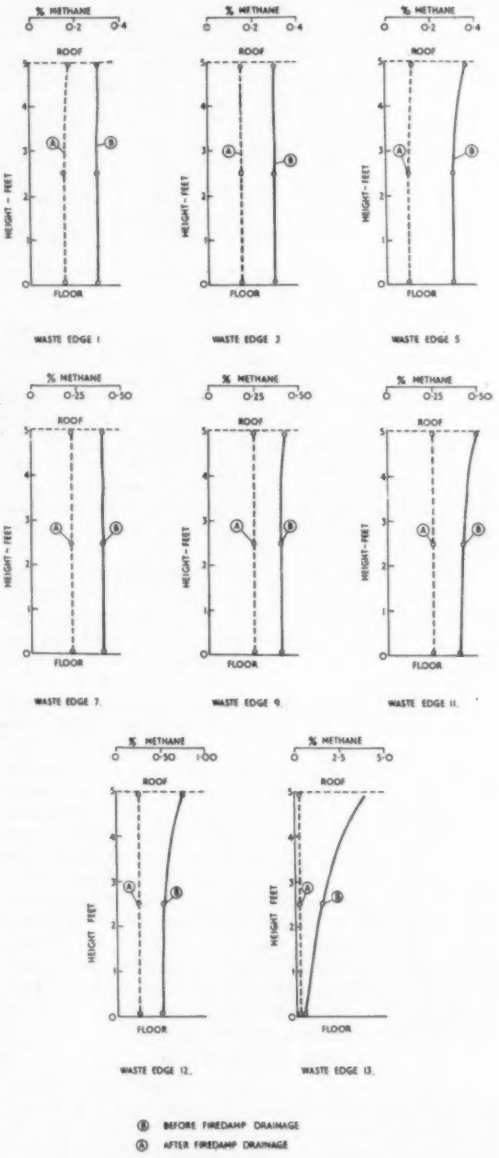


FIG. 10.—EFFECT OF FIREDAMP DRAINAGE ON WASTE-EDGE METHANE CONCENTRATIONS.

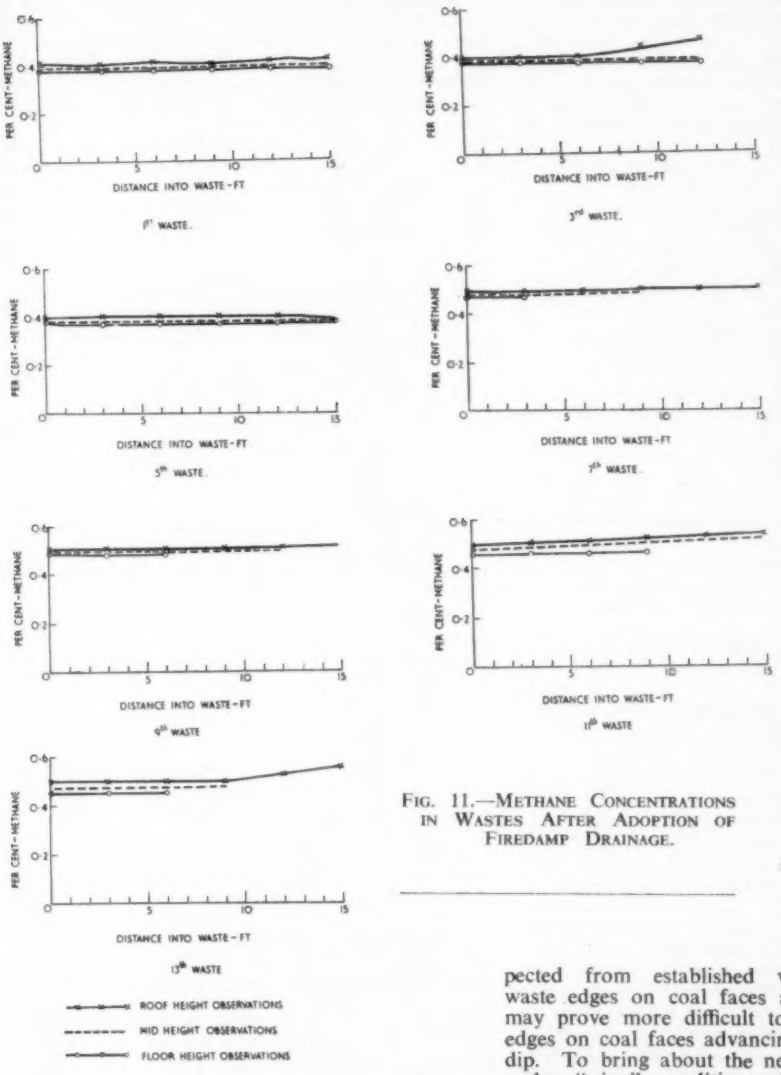


FIG. 11.—METHANE CONCENTRATIONS IN WASTES AFTER ADOPTION OF FIREDAMP DRAINAGE.

methane concentrations at waste edges and in wastes are smaller on the intake side than they are on the return side of a coal face. The conditions described above are typical of wastes in the Barnsley, Parkgate, and Beeston seams.

The general effect of firedamp drainage on gas in the wastes therefore, is to cause the methane front to retreat into the wastes. Indeed in many cases, methane concentrations in excess of about 0.6 per cent. have not been found at heights equivalent to two or three seam thicknesses for a distance up to about 20 ft. into the wastes. It follows that the wastes in such cases (to a known depth of up to 20 ft. from the waste edge) contain gas with low methane concentrations, and that the volumes of methane present are small.

Significant reductions in methane concentrations have not been obtained on all strip-packed coal faces with the application of firedamp drainage, however, because drainage has been applied to coal faces where waste methane concentrations were already low (about 0.25 to 0.40 per cent.). Even in some of these instances, however, it has been possible to reduce the methane concentrations in the last two or three wastes at the return end of the coal faces to about two thirds of the original values.

In exceptional cases, methane concentrations in the last two wastes at the return end of the coal face have been reduced to about one fifth previous values in about 10 min.

As might be expected from established ventilation principles, waste edges on coal faces advancing to the rise may prove more difficult to improve than waste edges on coal faces advancing on strike or to the dip. To bring about the necessary improvements under "rise" conditions, increased depressions, continuous plant operation and maintenance of boreholes closer to the ripping lip may be necessary.

Particular examples of the effect of firedamp drainage on methane concentrations at waste edges and in wastes are given below. The effect on waste edges is shown in Fig. 10 where methane concentrations in the range 0.30 to 0.50 per cent. in the first 11 wastes (from the intake gate) were reduced to half the original values. Methane concentrations at the first waste edge were reduced to about half the former values. At the edges of the last three wastes on the return side of the

coal face, methane concentrations at floor level were reduced to half the original values.

At waste edges of the twelfth and thirteenth wastes, methane concentrations at roof height were reduced to a third and one twentieth of the values existing before the introduction of firedamp drainage.

Conditions existing at waste edges after the introduction of firedamp drainage are shown to be almost constant for each waste and with height at the waste edge.

In fact, the difference between floor and roof height samples at the waste edge was within indicating limits of the methanometer. The increase in methane concentration along the waste edge from intake to return gate also is shown to be small.

An example of variations in methane concentrations within wastes of a coal face with total methane inflow of about 300 cu. ft./min. is given in Fig. 11. In this case samples were taken to a depth of 15 ft. into the waste where possible, and to heights up to about 12 ft. It was shown that there was very little variation in methane concentration with depth or height, apart from the last waste where a small increase in methane concentration existed at the time the observations were made.

The maximum methane concentration found was about 0.5 per cent.

Caved Coal Faces

Results on caved faces are similar to those described for strip-packed coal faces. On faces where roof caving occurs regularly, methane concentrations at the caved waste edge are often small (less than 0.4 per cent.) prior to adoption of drainage. Usually a consistent rise in general body methane concentration occurs at the return end of the coal face.

On some caved faces, prior to the introduction of firedamp drainage some additional features have been noted. Firstly, the space or waste left between the return gate side pack and the edge of the caved material may show higher methane concentrations than average. Secondly, a methane inflow may be detected passing around the return gateside pack from the waste (adjoining the return gate-side pack) along the front of that pack into the ventilating stream.

Thirdly, the methane flow rate into the return gate itself may be higher than on strip-packed coal faces resulting in a more rapid methane build-up in the return gate.

With the application of firedamp drainage, apart from return-end waste, waste-

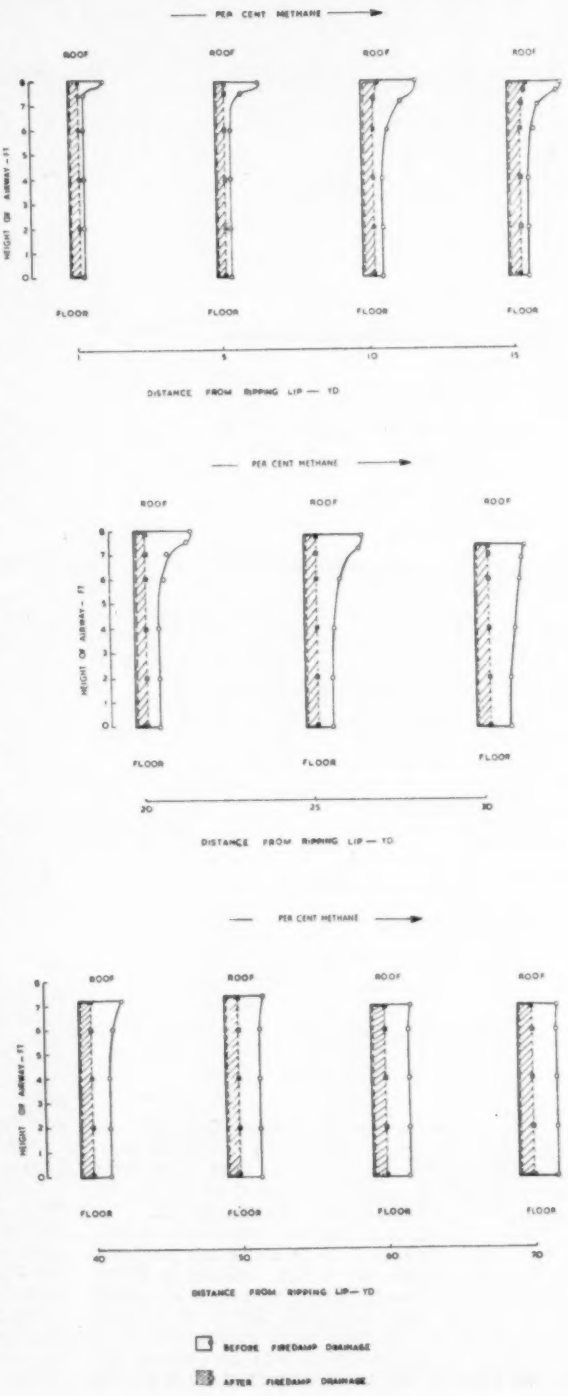


FIG. 12.—EFFECT OF FIREDAMP DRAINAGE ON LAYERING IN GATE ROADWAYS.

edge concentrations remain similar to or less than the original values. However, the gas flow from the gateside waste is reduced or eliminated, and the original build-up in methane content in the return gate is removed. In consequence, a significant reduction occurs in methane concentrations at the return end of the coal face, at the 10-yd. (return) sampling position and in the return gate. Results similar to those shown have been obtained on caved faces. Some of the highest percentage capture values in the North-Eastern Division (of about 70 per cent.) have been obtained on highly mechanized caved faces.

Problems on solid-stowed coal faces usually appear at intake and return gate ripping lips. In the absence of faults, it has been possible to reduce methane concentrations at intake ripping lips, on coal faces, and return gates to half the original values by the application of firedamp drainage.

In some intake and return gates (usually return gates) in moderately gassy or gassy seams, a tendency for methane concentrations at a given position to increase from floor to roof is known. If methane concentrations are significantly higher near the roof, gas layering is said to exist. The effect may be evident within 70 or 100 yd. of a ripping lip, but will depend on the gradient of the gate, persistency of gas feeders, and other local considerations.

Where gas layering is present, methane concentrations increase rapidly towards the roof despite the fact that samples are taken in a positive ventilating stream. In some cases, large methane gradients, shown by rapid variation in methane concentrations with height, can be found within inches of the top of an arch; in other instances, layering may be a foot or more in thickness.

Although a considerable amount of work has been done to remove gas layering by increasing mean and local air speeds to over 150 ft./min. (the latter by the use of obstructions such as inclined brattice sheets or screens), it has not always been possible to romove layers where gas feeders are persistent.

However, by the introduction of firedamp drainage and the constant application of reasonable borehole suction, a number of gas layering problems has been eliminated.

The effect of firedamp drainage on gas layering

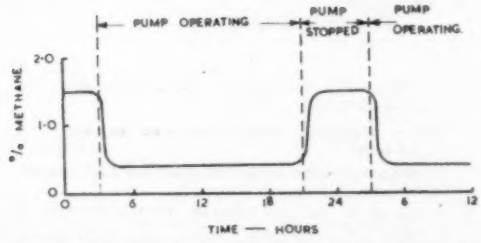


FIG. 13.—EFFECT OF PUMP OPERATING PERIODS ON GENERAL BODY METHANE CONCENTRATIONS IN A VENTILATING DISTRICT.

can be demonstrated by plotting methane concentrations at different heights at a given position in a roadway, as in Fig. 12. The methane distribution obtained invariably resembles an inverted rubber boot showing similar methane concentrations from the floor to a few inches, or a foot or so from the roof of the gate roadway. Near the roof, however, methane concentrations increase rapidly. The effect of firedamp drainage is marked in that it not only eliminates or almost removes the pronounced increase in methane concentrations near the roof, but it also ensures that more or less constant methane concentrations exist from floor to roof.

By the application of firedamp drainage, it has been found practicable to reduce methane concentrations at roof height to about one quarter or one tenth the pre-firedamp drainage values. It has been shown also that firedamp drainage can remove gas layering in intake as well as return gates when boreholes are drilled from return gates.

In many gate roadways, on the other hand, the variation in methane concentrations from floor to roof is small. When firedamp drainage has been employed, the variation in methane concentrations with height remains unchanged, but the methane concentrations themselves are substantially reduced. In instances where gas layering is persistent, continuous application of firedamp drainage is necessary.

Effect of Pump Operating Periods on Results

In most instances, although there are notable exceptions, the effect of pump operation on methane concentrations is not instantaneous and a period of 2 to 3 hr. elapses after starting an extractor pump, before the full effects of firedamp drainage on general body methane concentrations are realized. Methane concentrations in ventilating districts return to pre-firedamp drainage values in most installations after a pump stoppage of 3 to 4 hr. The effect of stopping and starting an extractor pump on general body methane concentrations in a typical installation is demonstrated in Fig. 13.

In a few exceptional installations, on the other hand, the full effect of starting the extractor pump has been realized in a matter of minutes, or at the most, in about half an hour. The recovery period following pump stoppage has been found to be of slightly longer duration.

The effect on methane concentrations at waste edges and in wastes depends upon the methane/time relationship for the district. In nearly all cases, however, the effect on methane concentrations in the last waste is rapid and reductions in methane concentrations in that waste are often measurable in a few minutes.

Where the overall effect on general body methane concentrations is comparatively slow, a comparatively long period elapses before reasonably constant values of methane concentration are obtained at waste edges and in wastes more distant from the return gate. Where rapid general body effects are encountered, on the other hand, quick reductions

in methane concentrations have been noted at waste edges and in wastes.

With boreholes drilled from return gates, it is being found that the time taken to reach steady methane concentrations at waste edges and in wastes, increases with distance along the coal face from the return to intake gates in level seams.

Hence, because the benefits obtained from firedamp drainage are directly attributable to pump operation, it follows that in most cases consistent and sustained improvements are attainable only with continuous extractor pump operation. It has been found, moreover, that the best results, particularly in wastes and at waste edges, are attainable by continuous extractor pump operation, as is practicable when pumps can be installed at the surface of a mine. Where applicable, electrical drives for extractor pumps have the merits of constant speed and almost constant suction values. It follows that close plant and installation control can be obtained in such cases.

Increase of extractor pump speed causes a rise in gas flow rate through the pump. The increase in gas flow rate can be calculated according to the affinity or "fan" laws which are well known in mine ventilation. Though increase in pump shaft speeds produces a higher gas flow rate, it does not necessarily follow that the methane rate of extraction is enhanced, since there is a limit to the amount of firedamp which can be drained from individual ventilating districts.

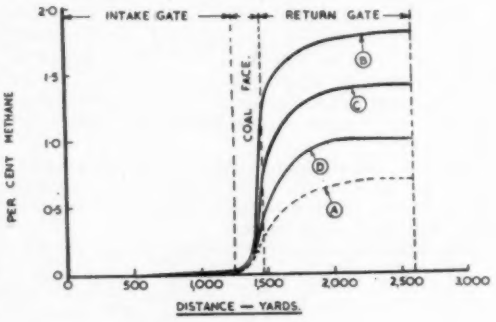
In the majority of cases, pump suction varies from 3 to 6 in. of mercury. Provided good standpipes, reasonable spacing of boreholes, and adequate angles of boring are adopted, it is found, in general, that increased suction brings about increased methane yields below pump suctions of about 5 in. of mercury (depending on the length of gas main) or until methane capture values of about 60 per cent. are realized. With suctions larger than about 4 in. mercury, it is found often that increasing the pump suction brings smaller incremental increases in methane extracted per unit rise in pump vacuum. The suction applied, however, is governed also by methane concentration in drained gas and liability or otherwise of the extracted coal seam and associated formations to spontaneous heating.

An indication of the benefits arising from increased pump suction in a seam not liable to spontaneous heating is given in Fig. 14. In a ventilation district in which the air flow rate was 10,000 cu. ft./min., the methane concentration at the 10-yd. return sampling position was 0.75 per cent. compared with about 1.4 per cent. at the outbye end of the return gate with a pump suction of 2.5 in. mercury. With a suction of 4 in. mercury, the corresponding methane concentrations were 0.65 and 1.00 per cent., compared with 0.60 and 0.80 per cent. for a pump suction of 5 in. mercury.

It can be shown that, with continuous pump operation and a percentage capture of about 50, methane concentrations found in gates and wastes of ventilating districts are to all practical purposes independent of variations in barometric pressure. This fact has been demonstrated at a number of collieries at which the Barnsley Seam is extracted where, despite the severe fall in atmospheric pressure on October 26-27, 1959 (estimated fall of about 1.5 in. mercury in 24 hr.), no adverse effects were experienced in ventilation districts in which firedamp drainage was practised. In those cases, the most prominent known effect of the fall in atmospheric pressure was a slight increase (of about 0.1 per cent. methane) at one or two waste edges. The firedamp drainage installations were operated as usual with normal pump suction values. In adjacent districts in the same seam, where firedamp drainage was not employed, however, the usual effects of a severe fall in atmospheric pressure were evident.

As might be expected, with discontinuous operation of extractor pumps, however, it is possible to show that methane concentrations in gates and wastes of ventilation districts may be related to variations in barometric pressure, but in most cases, where firedamp drainage is applied on an intermittent basis, the full effects of variations in atmospheric pressure are not experienced. Practical results, therefore, indicate that rate of extraction should be related to the methane make in the district and that consistent and repetitive results can be obtained when it is practicable to operate the extractor pump continuously during the week.

In most installations, the effect of firedamp drainage on the total methane yield in a ventilation district is either negligible or small. As an apparent result of firedamp drainage, a reduction in total methane make in the ventilation district may occur. This decrease is often of the order



A. AFTER FACE STANDING FOR 7 DAYS (HOLIDAY PERIOD NO FIREDAMP DRAINAGE)

B. FACE PRODUCTIVE BEFORE INTRODUCING FIREDAMP DRAINAGE.

C. PRODUCTIVE WITH FIREDAMP DRAINAGE AND PUMP VACUUM 2·5 IN. Hg

D FACE PRODUCTIVE WITH FIREDAMP DRAINAGE AND PUMP VACUUM OF 4·5 IN. Hg

FIG. 14.—EFFECT OF EXTRACTOR PUMP SPEED ON GENERAL BODY METHANE CONCENTRATIONS IN A VENTILATING DISTRICT.

of 5 to 10 per cent., and is evident with some caved faces.

Immediately after drilling the first borehole, however, a transistory increase in total methane make of from 5 to 10 per cent. may be found to have taken place. The effect is of short duration, and appears to be lost in about 7 hr., after which time the total make in the ventilation district is similar to, or slightly less than, that which existed prior to the introduction of firedamp drainage.

In exceptional cases, however, the application of firedamp drainage has resulted in a temporary increase of about 25 per cent. in total methane made in a very gassy ventilation district. With continuous drainage, however, the total methane make in such districts returns to the original value in due course. Where faults are present additional amounts of methane have been extracted from ventilating districts in exceptional instances.

Possible Effect of Spontaneous Heating

Because of the difficulties associated with spontaneous heatings in the Barnsley Seam in certain localities, much thought was given at first to the possible effects of firedamp drainage on that problem. Since the introduction of firedamp drainage, therefore, systematic control of plant and rate of extraction have been sought and samples have been taken regularly in return gates and from boreholes.

Of the 31 gates now being used for firedamp drainage, 20 are in the Barnsley Seam, and as far as is known, drainage has not increased the liability to spontaneous heating. During the period of application of drainage, a vast amount of sampling has been done and a considerable amount of information has been collected. The evidence available suggests, among other things, that methane concentrations in the wastes, are reduced by notable amounts, but that the values of the $\frac{CO}{O_2}$ ratio (as obtained at control sampling positions in return gates) are not affected significantly.

For example, results taken in one return gate in the Barnsley Seam over an extended period showed little or no variation in the average, maximum, or minimum values of the $\frac{CO}{O_2}$ ratio. No physical indications of heating were obtained. The results obtained in another gate are summarized in Table 6.

TABLE 6.—*Effect of Firedamp Drainage on General Body CO/O_2 Ratios in a Seam Liable to Spontaneous Heating.*

Condition.	$\frac{CO}{O_2}$ ratios.		
	Mean.	Min.	Max.
Before firedamp drainage	0.41	0.16	0.64
After firedamp drainage	0.48	0.26	0.67

In cases where output is maintained at a constant rate before and after the introduction of firedamp drainage, the methane yield per ton remains almost the same. Two particular features are noticeable, however:—(*a*) There is a tendency for the methane yield per ton to decrease by about 5 to 10 per cent. (in accordance with a decrease in total methane yield) after the introduction of firedamp drainage; and (*b*) random variations in methane yield rates (and, therefore, in methane yields per ton) are not so prominent after the introduction of firedamp drainage as they were before.

In one district, the average methane yield per ton before the introduction of firedamp drainage was about 1,700 cu. ft. Subsequently, with continuous firedamp drainage, the corresponding average figure was 1,625 cu. ft./ton. Over the periods in question, the mean saleable daily outputs from the district were practically identical.

On the other hand, where daily production has been increased partly as a result of the introduction of firedamp drainage, it has been observed that the rate of methane yield is somewhat higher, but the additional yield rate is not proportional to the increase in production and the methane yield per ton may be significantly smaller. These facts have been widely observed on highly mechanized coal faces also where firedamp drainage has not been applied.

The following example illustrates the changes which accompanied the application of firedamp drainage and increased production. Before the introduction of firedamp drainage, the average rate of methane emission was 172 cu. ft./min. for a mean daily output of 338 tons. After the introduction of firedamp drainage, the mean total rate of methane emission was 176 cu. ft./min. for a daily output of 450 tons. The average methane yield prior to the application of firedamp drainage and increase in production was of the order of 1,000 cu. ft./ton, compared with about 750 cu. ft./ton after introducing firedamp drainage and increasing output.

In this case also, it was significant that the random variations in methane yield rates were smaller and considerably less frequent after the introduction of firedamp drainage.

Effect of Weekend Stoppages

With intermittent extraction, stoppage of coal faces at weekends appears to have little effect on the rate of extraction during the working week. As in other general ventilation cases, however, there is a tendency to have lower methane concentrations in return gates at the beginning of the week. With continuous extraction in moderately gassy or gassy districts, the effect of face stoppage at weekends usually is not noticeable in the results.

If the effect of annual holidays is examined the following principal facts emerge from provisional investigations in gassy seams:—(*a*) The total rate of extraction decreases fairly regularly until, at the end of a fortnight, the rate of extraction is from 70 to 80 per cent. that which previously appertained. (*b*) After recommencement of production, total rate of extraction recovers quickly and by the end of the first week has returned almost to the pre-stoppage level. (*c*) Methane concentrations in drained gas tend to remain the same, though in one case a reduction of from 3 to 8 per cent. in methane concentration in extracted

gas was observed during a holiday period. Similar results have been obtained when coal faces are non-productive for short periods.

Acknowledgments

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The author acknowledges the assistance received from ventilation engineers at division and Area level with field work and in the preparation of this paper.

The views expressed in the paper are personal ones and not necessarily those of the National Coal Board.

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Protection Against Electrical Faults

THE Coal and Other Mines (Electricity) Regulations, 1956, require that in any transformer at a mine, suitable provision be made to guard against danger arising from the charging of lower voltage components by contact with or leakage from higher voltage components. This requirement has created difficulties when the method of earth fault protection for the lower voltage system entails the severe restriction of fault currents which may flow should a line to earth fault occur on the lower voltage system.

Mr. E. Maloney, of the National Coal Board's electrical branch, has found that the regulation can be met by connecting the output line(s) of the transformer and the earth of a device, such as a spark-gap unit, which will short-circuit should the line to earth voltage exceed a value which is considered safe. Operation of the device would cause the earth fault protection equipment on switchgear feeding the transformer to open.

Should one of the devices fall accidentally and cause a short circuit between a lower voltage line and earth, such a fault could be made to cause the lower voltage earth leakage system to operate. Protection, as required by the regulation, is provided by the switchgear feeding the transformer. To give dual protection, the lower voltage system of earth leakage protection could easily be arranged to operate under conditions of higher voltage system to lower voltage system fault.

The value of current flowing through the spark-gap unit under conditions of fault between the higher and lower voltage system can be restricted by placing a current restricting device, such as a choke or resistor, in the path of the fault current.

National Coal Board Specifications

SPECIFICATIONS recently issued by the National Coal Board include those mentioned below. They may be obtained from the board at Hobart House, Grosvenor Place, London, S.W.1, the charge for each one being 6d. unless otherwise stated.

No. 102/1961 covers a range of non-flameproof, 3-phase, 50 cycle, a.c. squirrel-cage, foot-mounted motors for general purposes and having totally enclosed fan-cooled enclosures. Fan cooling, according to the makers' practice, may be omitted for the smaller sizes.

No. 178/1961 (price 9d.) refers to brushes in domestic and general use, excluding decorators', industrial, and laboratory brushes.

No. 270/1961 relates to donkey jackets made from blue Melton cloth.

No. 271/1961 covers miners' safety helmets. It deals with the construction and materials of the helmet shell and harness, the flammability of the materials used for the shell, the mechanical strength of the helmet at room temperature when wet and at 120 deg. F. when dry, and with the surface finish of fibre helmets.

No. 272/1961 applies to low-density black polythene tube for use in cold-water services and in flush, overflow, and warning pipe applications.

No. 273/1961 (price 1s.) establishes leading dimensions and common details for two types of battery covers (side cable entry and top cable entry) and battery case tops for miners' cap lamps.

No. 274/1961 applies to 2½-in. internal dia. impervious lined delivery hose suitable for general fire service use at working pressures up to 150 lb./sq. in.

No. 276/1961 lays down nominal lighting output, life, and other relevant information for the types of discharge lamp which are in general use.

RAIL WAGON ACCESS LADDER

MR. H. BLAIR, a coke-oven manager in the National Coal Board's Durham Division, has devised an aluminium rail wagon access ladder which makes getting in and out of hoppered bottom or flat-bottom wagons both easier and safer. The device, which is suitable only for surface work, can be used also for obtaining coal samples from the top of full wagons, trimming coal from wagons, and cleaning out open-topped tanks or wells to a depth of 6 ft. 6 in.

The ladder is made of aluminium alloy with anti-slip rung surfaces. It consists of an 11-ft. 1-in. main ladder incorporating a 6-ft. 6-in. shorter ladder capable of sliding on two grooved pulley wheels within the side stringers, thus allowing the short ladder to be pushed up and swivelled over into a wagon and pulled up and swivelled back out of the wagon.

The movement of the short ladder acts as a counterweight and balancing agent when the user is near the top of the main ladder, the total weight of both ladders being 35 lb.

SOLIDIFICATION of *Ingot Feeder Heads*

EFFECT OF EXOTHERMIC POWDERS AND LININGS

Known methods of influencing the solidification of ingot feeder heads are briefly reviewed in this paper, translated from Hutnické Listy, 1960, XV, No. 4, pp. 266-275. The authors, Lubomír Smrha and Ivo Brodsky, members of the research staff at the Klement Gottwald Iron and Steel Works, Vítkovice, Ostrava, then describe experiments with various exothermic powders and lining materials, including Thermit, which they carried out at Vítkovice. Comments on the paper by N. Chvorinov, together with the authors' reply, will be published in a subsequent issue.

IN recent years our steelworks have started to concern themselves with a reduction in the top discard from ingots. It is not necessary to particularize that this has arisen, on the one hand from the attempt to improve the economics of production, and on the other from the fact that various methods of influencing the solidification of ingot feeder heads* have started to be applied under production conditions abroad.

The top discard from killed steels, amounts to about 13 to 20 per cent. of the weight of the ingot, and on large forging ingots to even more. At a first glance, therefore, it is a very attractive proposition to obtain, by a reduction in the weight of feeder heads, a real increase in the output of steel; nevertheless, the fact that hitherto highly effective methods of heating feeder heads have spread only too little—and this applies even abroad—is evidence that the problem of influencing the solidification of ingot feeder heads is not a simple one, and for the most part demands complex solutions, which can differ considerably in individual works according to the production conditions.

Although the development of new methods of heating ingot feeder heads is a difficult problem, it does not mean that it is insoluble. Its solution demands close co-operation between research workers and metallurgists in production, and during the erection of new works of designers also, since in new works the best conditions exist for mechanization or automation of methods of heating feeder heads, and an opportunity occurs to adjust the composition of production and transport.

* TRANSLATOR'S NOTE.—For the sake of clarity, throughout this paper the term hot top is used for the refractory head placed on top of an ingot during teeming, and feeder head for the metal enclosed within it above the body of the ingot.

Known Methods of Influencing the Solidification of Ingot Feeder Heads

It has been shown that a radical reduction in the weight of a feeder head can be achieved primarily by intensive heating of the steel in the hot top and restriction of the heat losses into the lining of the hot top and through its surface. Several methods have been evolved[1]: (1) Heating by electrical energy (electric arc, electroslag, and induction heating); (2) heating with an oxy-gas flame; (3) heating with oxygen and an exothermic addition (method of N. Chvorinov); (4) heating with exothermic powders; (5) heating with exothermic briquettes, inserts, linings, etc.

In Table 1 are clearly set out the individual methods of heating and the average weights of the feeder head obtained. With small ingots it is possible to obtain by electric heating and exothermic linings even better results than those shown in Table 1.

TABLE 1.—*Individual Methods of Heating.*

Method of heating ingot feeder head.	Average weight of feeder head obtained as percentage of weight of ingot.
Electrical heating	6–8
Oxy-gas heating	6–8
Oxygen-exothermic addition	6–9.5
Exothermic powders with ferro-alloys ..	8
Exothermic inserts	5–7

Exothermic Powders

The use of exothermic powders is the simplest method, and therefore has the greatest prospect of introduction and expansion under production conditions. Cheap and effective exothermic powders based on ferro-alloys and sodium nitrate were first introduced under production conditions in the USSR in the "Hammer and Sickle" Works[2]. In Czechoslovakia, this powder started to be used later at the United Steelworks in Kladno[3]. A powder containing ferro-alloys was introduced in the old

steelworks at the Vitkovice Iron and Steel Works[4].

In steelfoundries abroad use is made of an exothermic powder containing Thermit[5]. This method was used on ingots in Finnish steelworks at the Imatra Works[6] and was investigated by English research workers. In Czechoslovakia, powders containing Thermit have not found wide application in production, mainly on account of the relatively high price of aluminium. In addition, these exothermic powders are unsuitable for alloy steels, for there is danger of the occurrence of " white spots " in the ingot.

In view of the steadily increasing use of the method of heating feeder heads by means of exothermic powders, it is expedient to group known exothermic powders according to composition and assess the advantages and disadvantages of the individual types.

(*a*) Powders Containing Ferro-alloys

Their main effect consists in the fact that as a result of the sudden exothermic reaction a distinct superheating of the steel in the ingot hot top takes place. According to measurements of the temperatures of steel after the use of these powders, the maximum degree of superheating attained is about 30 deg. C.[2]. From the reaction products a fluid slag is formed, which must be isolated by sprinkling with a protective powder (producer gas soot, sand, light ash). The advantage of these powders is their relatively low cost. The disadvantage is the formation of a large quantity of fume containing harmful oxides of nitrogen, the occurrence of sparks and flame, and finally the danger of affecting the chemical composition of the steel below the ingot feeder head.

(*b*) Powders Containing Thermit

Superheating of the metal in a hot top is obtained both as a result of the strong exothermic reaction and also through the physical heat of the hot iron formed by the reduction of the scale or ore. Once again the disadvantage is the intensive occurrence of showers of sparks and flame, the possibility of the occurrence of chemically inhomogeneous areas in the ingot, or an increase in the Al content of the steel, and, finally, the great wear on, and destruction of, the lining of the hot top.

(*c*) Powders Not Containing Thermit

Superheating of the metal is obtained as a result of the chemical reaction between aluminium, magnesium, and their alloys, on the one hand, and atmospheric oxygen on the other. The advantages are the ability to control the chemical reaction, limitation or complete avoidance of sparks and flame, a considerable reduction in heat losses during the actual reaction, *i.e.*, better utilization of the heat liberated by the reaction for heating the steel, etc., but the main advantage by comparison with the preceding types of powders is that the chemical composition of the metal remains unaffected in either the feeder head or that part of the ingot below it. The disadvantage perhaps is the somewhat higher cost of this powder, which is compensated, however, by its lower specific consumption, as will be shown later.

Results Obtained with the Individual Types of Exothermic Powders

(*a*) Powders Containing Ferro-alloys

According to production results in the " Hammer and Sickle " Works, a two thirds reduction was achieved in the top discard from ingots weighing 800 kg. through the use of an exothermic powder. The original weight of the feeder head was 10.5 per cent. of the weight of the ingot. The specific consumption of powder was 1 to 1.2 kg./ton steel. The chemical composition in the body of the ingot remained unchanged. In the feeder hear' part an increase took place in the carbon and silicon contents.

According to experience under production conditions at the Vitkovice Steelworks on larger ingots, weighing from 3.8 to 11 tons, in the best instance the same results were obtained as at the " Hammer and Sickle " Works. On 7.4-ton slab ingots the weight of the feeder head was 8.3 per cent. of the weight of the ingot. The specific consumption of powder, however, was higher, namely, 2 to 3 kg./ton steel. The chemical composition in the body of the ingot remained normal, but in the feeder head a marked carburization and enrichment in silicon took place. At the New Klement Gottwald Steelworks[7] through the use of an exothermic powder a weight of the feeder head of about 8 per cent. of ingot weight was obtained on 6-ton ingots. The specific consumption of powder was 1.5 kg./ton, and its cost is 4.50 Kcs/kg. If steelworks powder is available within the same organization its cost is relatively lower; at the

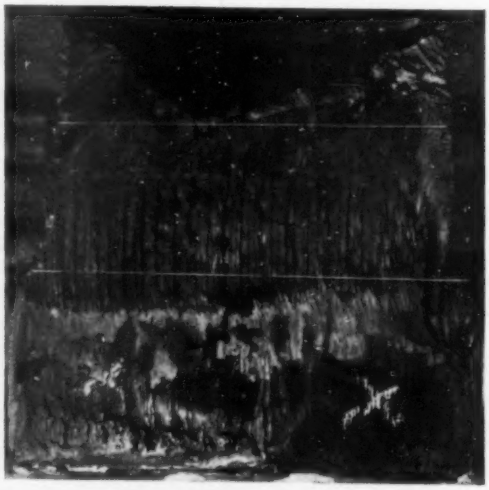

Fig. 1.—Feeder Head of a 2-ton Ingot with Solidification Influenced by Exothermic Powder not Containing Thermit-rammed Fireclay Lining of Hot Top.

Vitkovice Steelworks, for instance, the powder costs 2.60 Kcs/kg.

(*b*) POWDERS CONTAINING THERMIT

These powders for heating ingot tops are used under production conditions at the Imatra Works in Finland[6]. The average weight of the feeder head of 2.5-ton ingots of mild steels is 5.3 per cent. The quantity of Thermit added is 10 kg./ton, which corresponds to an average Al consumption of 2.5 kg./ton. The method of adding this powder is completely different from normal practice, for the greater part is added only after a certain period has elapsed after teeming. The optimum time for adding the mixture is determined from an empirical equation

$$t = 0.0124 \cdot d^2$$

where "t" is the time in minutes after teeming when the powder is added; and "d" is the maximum diameter of the ingot in cm.

The cost of 1 kg. Thermit without mixing and grinding in Czechoslovakia is about 1.72 Kcs/kg.

(*c*) POWDERS NOT CONTAINING THERMIT

In view of their advantages these powders were the main subject of our experiments. In Fig. 1 is shown a section through the feeder head of a forging ingot weighing 2 tons, where solidification was influenced by an exothermic powder containing aluminium[8]. The average Al consumption for these experiments was 1.58 kg./ton steel. The feeder head weighed 13 per cent. of the weight of the ingot. During the experiment, however, the required height of the feeder head was not maintained, which led, as follows from Fig. 1, to a considerable increase in the dimensions of the feeder head, which could be decreased by 50 to 60 per cent.; in this way a weight of the feeder head of about 5 per cent. of ingot weight would be obtained. The example cited of a reduction in the height of the feeder head and an increase in the yield is possible, mainly because the powder used does not influence the chemical composition of the feeder head and of the zone of the ingot below it. The price of the powder without the costs of mixing and grinding the scrap components is about 3.93 Kcs/kg. So far as the maximum economy in the use of this type of exothermic powders is concerned, we have ideas for the further reduction of the average consumption, and in this direction further production experiments will be carried out. Even so, however, a provisional economic analysis is very much in favour of powders not containing Thermit. For calculation of the saving we used this equation[9]:

$$U = \frac{I + V}{0{\cdot}01} \quad \frac{z}{v(v+z)} - \frac{S \cdot z(o+v)}{v(v+z)} - \frac{No}{(v+z)} \cdot 100$$

where U denotes the saving in Kcs/ton of rolled products (forgings);
V denotes the costs for mechanical working of the ingots per ton;
S denotes the cost of return scrap in Kcs/ton;
No denotes the heating costs per ingot ton;
z denotes the percentage increase in output through heating the ingot feeder heads;
v denotes the normal percentage output to the blooming mill; and
o denotes the normal discard as a percentage of the weight of the ingots, at the price of the ingots in Kcs/ton.

In order that the results of the various methods of heating the ingot feeder heads with exothermic powder might be comparable, it was necessary to determine the lower limit of the weight of a feeder head without influencing solidification by any heating method. This value was established at 9.6 per cent. of the weight of the ingot. For normal carbon, unalloyed steel the resultant values are clearly compiled for the various alternative methods of influencing the solidification of ingot feeder heads in Table 2, which clearly shows the economy gained by the use of powders not containing Thermit.

TABLE 2.—*Comparison of the Economics of the Use of Powders.*

Method of influencing the ingot hot-top.	Amount of top discard obtained per cent.	Average powder consumption, kg/ton.	Price of powder, Kcs/ton steel.	Saving in Kcs./ton rolled products.
Without influencing solidification ..	9.6	—	—	—
Exothermic powder with ferro-alloys ..	8.0	0.9	4.05	9.50
Exothermic powder with Thermit	5.3	10.0	19.40	17.15
Exothermic powder without Thermit	5.3	3.0	13.90	22.65

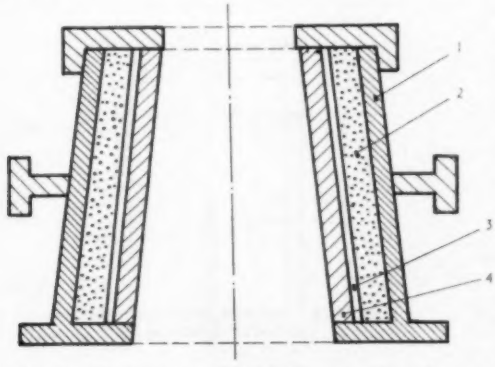

FIG. 2.—DIAGRAM OF BISRA DESIGN HOT TOP. 1.—CAST CASING. 2.—INSULATION MATERIAL (VERMICULITE). 3.—THIN PLATE. 4.—COATING.

The effect of the exothermic powder can in certain instances be improved through the use of an insulating rammed or bricked lining of the hot top. In Fig. 2 is an insulating hot top designed by BISRA workers.[10] Under production conditions a certain amount of difficulty is presented by the thin protective plate[3] with the heat-resistant coating.

Simpler is the use of insulating substances which stand direct contact with the molten steel. Here various solutions are basically possible. We tried

out the insulating properties of a heat-resisting substance with a high content of ash. Measurement of the course of solidification of steel cast into a cylinder of this experimental substance showed, by comparison with normal fireclay, that the time of solidification is about 40 per cent. longer. It is probable that even better results are obtained through the use of insulating substances with very low bulk densities, such as foamed fireclay, etc.

Exothermic Inserts

It is generally stated that this method of heating ingot tops is the most effective. This, moreover, was the argument of independent producers of exothermic linings under various trade marks, such as "Feedex," "Ferrux," "Kellog," etc. The use of exothermic substances as inserts into hot tops in various forms is relatively new, and therefore there are few papers which have been published on this method of influencing the solidification of ingot tops. Atterton and Edmonds[5] handle the problem on the theoretical side, and suggest application only for castings of steel or other metals. Shephard[11] is concerned with the results of the use of "Feedex" and "Ferrux" exothermic linings, of which the accurate composition is not given, on ingots of stainless steel weighing 500 kg.

From an original volume of the feeder head of 14 per cent. of the ingot, through the use of exothermic linings it was possible to lower the volume of the feeder head to 5 per cent. of the ingot. The feeder head was free from shrinkage cavities, and the surface was completely level.

FIG. 3.—FEEDER HEAD OF A 3.8-TON INGOT WITH SOLIDIFICATION INFLUENCED ONLY BY INSULATING POWDER.

Franckiewicz[12] reports the results obtained from ingots of stainless steel weighing 130 to 1,000 kg. For the lining a mixture of aluminium, magnesium, and iron ore is used in stoichiometric proportions. To this mixture magnesite is added to slow down the reaction. The increase in output amounted to 8 per cent. of the weight of the ingot, where the original weight of the feeder head was 16 per cent. of that of the ingot. A considerable disadvantage of this method of influencing the solidification of ingot feeder heads, in the light of the published patent of the author, is the use of very finely ground raw materials, namely, aluminium, ore, and magnesite (fineness of grinding less than 0.05 mm.).

A. Theis and K. Nitschke[13] have described production experience in the use of exothermic linings for feeder heads of small ingots, but do not state the composition of the exothermic linings used. For stainless steels the weight of the feeder head was decreased from 12 to 5 per cent. of that of the ingot. In order to obtain a feeder head which does not have a marked shrinkage cavity, exothermic powder must simultaneously be used as well as the exothermic lining.

At the Vitkovice Steelworks we considered the application of this method of heating to alloy steels. Czechoslovak State Standard class 17 alloy steels are poured for the most part into square section ingot moulds. The ingot weighs 3,850 kg. and the average weight of a feeder head amounts to 16 per cent. of the weight of the ingot. In Fig. 3 is shown a section through the top of this VI A ingot after gas cutting. On the basis of the theoretical data on the solidification of ingots, and from the paper of Atterton and Edmonds, it was clear that the problem of the heating of larger ingots with the use of exothermic linings is disproportionately more complicated than that of small ingots. If the occurrence of a shrinkage cavity in the feeder head of an ingot is to be prevented, solidification of the feeder head must take place in a vertical direction, and solidification of the steel from the wall of the ingot hot top must be restricted to the minimum possible extent. This means that superheating of the steel in the hot top

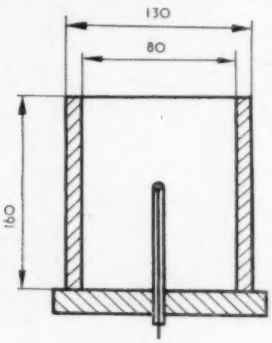

FIG. 4.—DIAGRAM OF THE EXPERIMENTAL CYLINDER FOR MEASUREMENT OF THE EFFECTIVENESS OF EXOTHERMIC INSERTS.

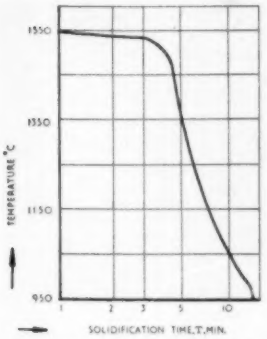

FIG. 5.—SEQUENCE OF TEMPERATURES IN THE EXPERIMENTAL CYLINDRICAL CASTING—NON-REACTING MIXTURE.

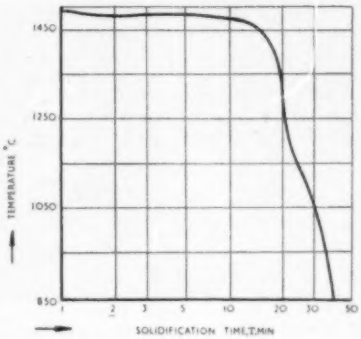

FIG. 6.—SEQUENCE OF TEMPERATURES IN THE EXPERIMENTAL CYLINDRICAL CASTING—READILY REACTING MIXTURE.

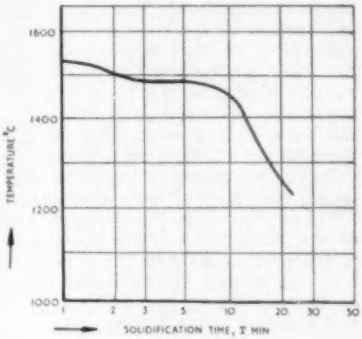

FIG. 7.—SEQUENCE OF TEMPERATURES IN THE EXPERIMENTAL CYLINDRICAL CASTING — EXOTHERMIC MIXTURE CONTAINING POWDERED ALUMINIUM.

must take place in such a way that the steel shall not start to solidify here earlier than the body of the ingot solidifies over the whole cross-section. For clarity we give an example:—

A square-section ingot has an edge length d = 250 mm., and its weight is about 650 kg. Solidification time with average superheating is about 16.5 min. A VI A square-section ingot has an edge length d = 580 mm., and the weight of an ingot is 3,850 kg. Solidification time is about 88.5 min.

In the first instance of the small ingot it is not difficult to superheat the steel in the feeder head so that solidification shall not start for a period of 16 min. In the second instance it is problematical, in view of the fact that up to the present time no suitable insulating materials are at our disposal, which in the range of high temperatures would have such insulating power that they would maintain the steel in the hot top at a superheated temperature for a period of 90 min., and no solidification would take place from the walls. An exothermic insert likewise has a substantially shorter heating period by comparison with the calculated solidification time of 90 min.

On the grounds set out above, in the first part of the experiments we devoted our attention to the development of a suitable exothermic material with a relatively long heating period. From the thermodynamic values it follows that the most suitable fuels in thermic mixtures are aluminium or magnesium and their alloys. First of all for the tests we used pure aluminium, granular material. After the first preliminary tests we investigated the effectiveness of exothermic inserts by laboratory means. A diagram is shown in Fig. 4. The experimental exothermic materials were compacted into the form of a cylinder 160 mm. in height, with an internal diameter of 80 mm. The cylinder was placed on a fireclay brick, through which passed a silica capillary tube with a Pt-PtRh thermocouple. The thermocouple was located in the centre of the experimental cylinder, and by means of a compensating, recording instrument the sequence of temperature of the steel was measured in relation to time.

From a small, high-frequency furnace, molten steel was poured into the cylinder, and the time of solidification and the sequence of temperatures in the cylinder were measured[14]. By this means it was possible to compare the effectiveness of exothermic linings, by comparing the solidification times of the cylinders which were cast. A series of measurements were made, the aim of which was to explain the effect of the aluminium content, its particle size, the effect of the proportion of aluminium to the oxide additions, etc., on the time of solidification of the cylinder.

In Figs. 5 to 8 are shown typical plots of temperatures inside cylinders made from various exothermic materials. From these experiments followed an important conclusion valid for

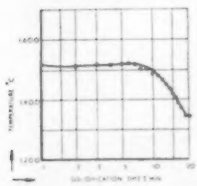

FIG. 8. — SEQUENCE OF TEMPERATURES IN THE EXPERIMENTAL CYLINDRICAL CASTING—MATERIAL NOT CONTAINING THERMIT.

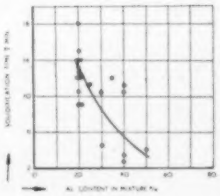

FIG. 9. — EFFECT OF THE AL CONTENT IN THE EXOTHERMIC MATERIAL CONTAINING THERMIT ON THE SOLIDIFICATION TIME OF THE CYLINDER.

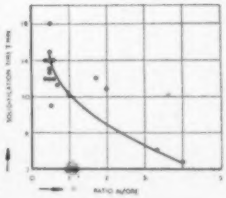

FIG. 10. — RELATIONSHIP BETWEEN SOLIDIFICATION TIME OF THE CYLINDER AND THE PROPORTION OF ALUMINIUM AND ORE IN THE MATTRIAL CONTAINING THERMIT.

mixtures containing Thermit. The higher was the Al content of the mixture, the less efficient it became (Fig. 9). This is shown even better in Fig. 10, in which is depicted the relationship between the solidification time and the proportion of aluminium to oxides. The higher is this ratio, the shorter is the solidification time. So far the effect of the particle size of the iron ore used is concerned, its effect in prolonging the solidification time is slight, within the limits of the experiment up to a particle size of 0.05 mm. To a certain extent the effect of the particle size of the aluminium is manifested as follows: excessively fine, powdered aluminium in fact appreciably increases the temperature of the exothermic lining, but the heating time is shorter, and the heat losses increase at the same time; likewise, the solidification time of the cylinder is shorter by comparison with the use of normal, granular aluminium material. The mixture used contained 20 per cent. granular aluminium material, the screen analysis of which may be seen from Fig. 11. As oxidizing addition we chose alkaline nitrates and iron oxides in quantities up to 50 per cent. The iron ore used had the screen analysis shown in Fig. 12. The choice of the addition of heat-resistant filler is important, the purpose of which is to retard the reaction and form a solid, porous layer with good insulating properties. We tried out a number of fillers: calcined shale, foundry sands, magnesite, ash from electric power plants, etc. A combination of shale and ash proved the best.

The practical introduction of exothermic, rammed linings, brick, and inserts depends to a considerable extent on the choice of a suitable binder, which must, under production conditions, ensure adequate safety and reliability in handling. Of the normally used, foundry and ceramic binders, sulphite extract, water glass, etc., fulfil these requirements. At the outset we used both these substances for binding our exothermic materials. During the experiments, however, it proved that their use is accompanied by considerable disadvantages. Sulphite extract in a reducing atmosphere causes the

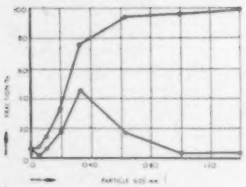

FIG. 11. — SCREEN ANALYSIS OF THE GRANULAR ALUMINIUM MATERIAL USED.

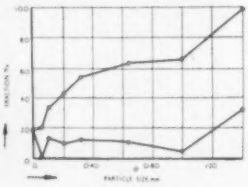

FIG. 12. — SCREEN ANALYSIS OF THE ORE USED.

formation of strong smelling sulphur compounds, while water glass causes softening and deformation of the exothermic material itself. In addition, in both instances unsatisfactory strength values are obtained even at very considerable additions of binder, which is to the detriment of the proper function of the exothermic material.

On the grounds set out above we changed over to binding with synthetic resins, which, above all, fulfil the demand for adequate strength even with a small addition much better than all the binders mentioned above. The technique of working with the resins, so far as the optimum addition of resins and the method of hardening them are concerned,

FIG. 13.—VARIOUS METHODS OF MAKING THE INGOT HOT TOP:—1.—CAST HOT-TOP CASING; 2.—FIRECLAY RAMMED LINING; 3.—INSULATING MATERIAL; 4.—PERFORATED SHEET; 5.—EXOTHERMIC RAMMED LINING; 6.—CARDBOARD.

was tested by us under laboratory conditions, and so we developed the bases for their successful application in production.

On the basis of the laboratory results we carried out experiments on a production scale with VI A ingots weighing 3.8 tons. In essence it is possible to use exothermic materials in the form of a rammed lining or shaped bricks for heating the feeder head. For the experiments we chose the first method as more rapid. The choice of shaped bricks demands a special press and various types of expensive moulds.

A reduction in the volume of an ingot feeder head can be attained in essence by the following methods:—(1) By lowering the level of the meniscus of the steel in the hot top during teemings; (2) by changing the profile of the lining of the hot top; (3) by redesigning the hot top; (4) by the use of unencased hot tops.

The advantage of the first method is the ability to use hot tops previously in use. The disadvantages are:—(*a*) The high consumption of exothermic material when ramming directly onto the cast-iron casing; (*b*) the low height of the feeder head does not facilitate, or makes impossible, stripping of the ingot; (*c*) if an insulating, backing brick is used, its maintenance is expensive.

The advantage of the second method is the ability to use hot tops already in use with simultaneous economic use of an exothermic rammed lining, and the ability to strip ingots even where a small amount of top discard is preserved.

The use of shaped bricks as unencased hot tops is applicable in those steelworks which teem a small number of different ingots, and the ingot moulds used have plane walls (not rounded), so that the shaped bricks shall have the simplest possible form. Difficulties with stripping exist here too naturally, if we wish to obtain the maximum reduction in the weight of the feeder head.

In order to make it possible for the future to use the original teeming hot top for ingot VI, we then reduced the volume of the feeder head by changing the profile of the lining of the hot top (Fig. 13*a*). The basic idea was to make the insulating lining with a reverse taper, so that the exo-

FIG. 14.—FEEDER HEAD OF A 3.8-TON INGOT WITH SOLIDIFICATION INFLUENCED BY AN EXOTHERMIC SUBSTANCE IN THE FORM OF A LINING.

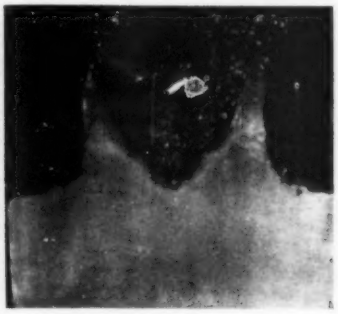

FIG. 15.—MACROSTRUCTURE OF THE INGOT OF WHICH THE FEEDER HEAD IS SHOWN IN FIG. 14.

thermic insert could be introduced separately into the hot top. Between the exothermic and insulating rammed linings a gap was formed, which was filled with insulating material, the porosity of which enables the gases forming during the reaction to pass through it. The exothermic insert is rammed into linings of thin perforated sheet, and in this way the problem of their transport is solved. A further alternative which we tried out, is the use of cardboard (Fig. 13*b*) as an insulating, dividing layer between the hot top rammed lining and the exothermic insert. Between the cardboard and the rammed lining of the hot top there can be further loose insulating material.

At the first experiment a single ingot was teemed. Solidification of the feeder head was influenced by an exothermic rammed lining, and onto the surface of the feeder head was placed a thin plate of exothermic material of the same composition as the lining.

The ingot was teemed from Ni-V alloy steel melted in a 30-ton electric arc furnace. The ingot was bottom poured. The teeming time for the body of the ingot was 5 min., and that for the feeder head 2.5 min. Sand was thrown on the surface of the teemed ingot. According to the small flame on the surface of the exothermic rammed lining the reaction lasted about 20 to 25 min. The exothermic plate on the surface of the top reacted very gradually, and its combustion took place too late. Fig. 14 shows the resultant shape of the shrinkage cavity in the feeder head after sectioning with a gas cutter. The macrostructure is to be seen in Fig. 15.

The weight of the feeder head was 3.8 per cent. of the weight of the ingot. The chemical composition in the part below the feeder head was normal.

In view of the fact that the shrinkage cavity extended right to the boundary between the feeder head and the body of the ingot, it was decided to carry out a further experiment, in such a way that heating of the meniscus of the steel from above was more rapid and more effective. In all, three ingots were poured on one teeming stool:—

INGOT NO. 1.—Solidification of the feeder head was influenced by means of a rammed lining; two 4-kg. bags of an industrially used exothermic mixture of ferro-silicon and sodium nitrate were thrown onto the meniscus of the steel. This was the material normally used for influencing the solidification of alloy steel ingots.

INGOT NO. 2.—Solidification of the feeder head was influenced with an exothermic, rammed lining; as for ingot No. 1, onto the meniscus of the steel, were thrown two 4-kg. bags of exothermic powder of the same composition, and in addition an exothermic briquette weighing 4 kg. of the same composition as the exothermic rammed lining, except that finer ore fractions were used.

INGOT NO. 3.—Solidification of the feeder head was influenced with an exothermic, rammed lining; onto the meniscus of the steel was thrown a

FIG. 16.—FEEDER HEAD OF AN INGOT WITH SOLIDIFICATION INFLUENCED BY AN EXTOHERMIC POWDER CONTAINING FERRO-ALLOYS.

FIG. 17.—FEEDER HEAD OF AN INGOT WITH SOLIDIFICATION INFLUENCED BY A LINING, POWDER, AND A BRIQUETTE OF THE SAME COMPOSITION AS THE LINING.

FIG. 18.—FEEDER HEAD OF AN INGOT WITH SOLIDIFICATION INFLUENCED BY AN EXOTHERMIC LINING AND FROM ABOVE BY A BRIQUETTE.

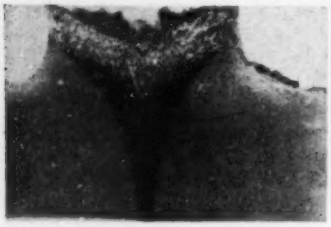

FIG. 19.—SULPHUR PRINT OF THE FEEDER HEAD SHOWN IN FIG. 16.

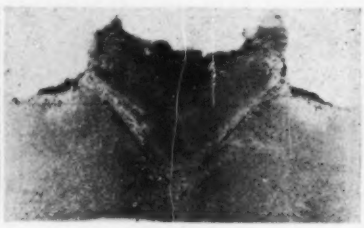

FIG. 20.—SULPHUR PRINT OF THE FEEDER HEAD SHOWN IN FIG. 17.

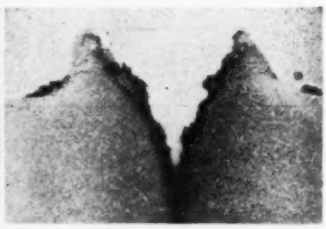

FIG. 21.—SULPHUR PRINT OF THE FEEDER HEAD SHOWN IN FIG. 18.

briquette weighing about 5 kg. of the same composition as the exothermic rammed lining, except that ore with a particle size range of under 0.1 mm. was used.

Sand was strewn on all the ingots, in order to prevent eventual carburization by the insulating powder.

The weights obtained for the feeder heads of ingots Nos. 1 and 2 from this melt were very low; for ingot No. 1 about 1.5 per cent. and for ingot No. 2 about 3 per cent. of the weight of the ingot. In Figs. 16 to 18 are photographs of sections through the feeder heads of ingots Nos. 1 to 3 after gas cutting. The results clearly show that the shape of the shrinkage cavity and that of the surface of the feeder head are predominantly influenced by the manner in which the cooling of the feeder head took place from above. It is necessary that superheating should take place rapidly after teeming. By carrying out tests on the macrostructures of these feeder heads, especially on ingot No. 1 we found very extensive cavities, which extended deep into the body of the ingot. In Figs. 19 to 21 are shown sulphur prints, and in Figs. 22 to 24 macrostructures of ingots Nos. 1 to 3.

A chemical analysis carried out on borings taken from the ingots completely confirmed that in the area below the feeder head considerable enrichment in carbon and silicon took place (Figs. 25*a* to 25*d*), but no evident increase in the P and S content. Borings for analysis were taken in accordance with the numbers in Fig. 22, and these numbers are shown on the plots in Figs. 25*a* to 25*d*. From this it may be judged that segregation does not occur, which is determined by the dimensions of the ingot, but there is contamination of the steel through the use of an exothermic powder of the following composition: 10 to 20 per cent. CaSi, 50 to 60 per cent. FeSi (75 per cent.), 30 to 40 per cent. sodium nitrate.

The total quantity of powder was 8 kg., of which FeSi (75 per cent.) represented 4 to 4.8 kg. This amount contains up to 5 g. carbon, which is dissolved in the steel, as follows from the foregoing. The same applies to a greater extent to silicon also. Steel which is considerably enriched in Si and C from the exothermic powder remains on the surface of the feeder head due to its lower specific gravity, and as it is fed, gradually extends deeper into the body of the ingot. The depth of the affected zone is influenced by the shape of the feeder head; in our instance the slenderness of the feeder head has an unfavourable effect. By rough calculation the weight of the central, considerably enriched part of the ingot was reckoned to be 2.8 to 3 kg.; in this volume 5 g. C can cause a change in the average composition by 0.18 per cent. C. On ingot No. 1 it is necessary to take into consideration the almost completely level surface of the feeder head, which is brought about by the surface layer already mentioned with a changed chemical composition and thus a lower melting point; on these grounds it was maintained longest in the liquid state.

Ingot No. 2 from this melt also showed marked changes in composition under the feeder head so far as the C and Si analysis is concerned, but

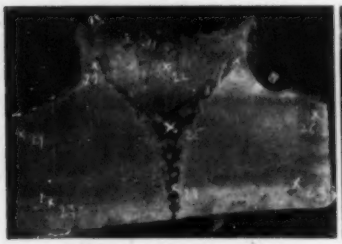

FIG. 22.—MACROSTRUCTURE OF THE INGOT FEEDER HEAD SHOWN IN FIG. 16.

FIG. 23.—MACROSTRUCTURE OF THE INGOT FEEDER HEAD SHOWN IN FIG. 17.

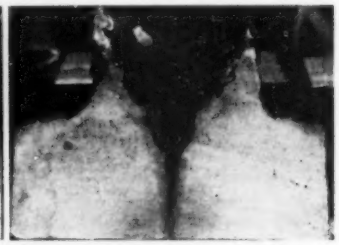

FIG. 24.—MACROSTRUCTURE OF THE INGOT FEEDER HEAD SHOWN IN FIG. 18.

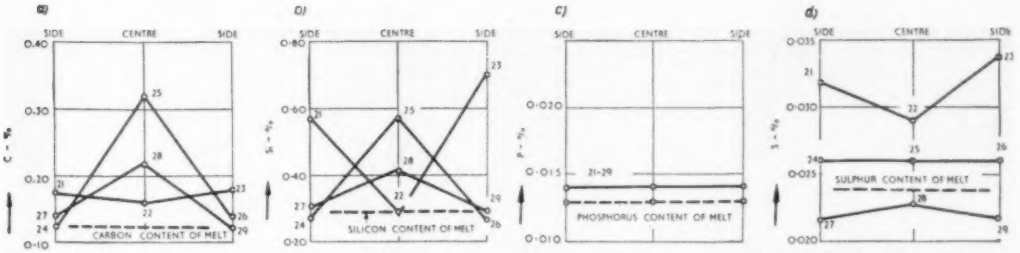

FIG. 25.—CHANGE IN THE CONTENT OF ELEMENTS IN THE INGOT FEEDER HEAD SHOWN IN FIG. 16:—(*a*) CHANGE IN THE C CONTENT; (*b*) CHANGE IN THE Si CONTENT; (*c*) CHANGE IN THE P CONTENT; (*d*) CHANGE IN THE S CONTENT.

they did not attain such high values as in the instance quoted above. Nor was a level surface of the feeder head obtained. The explanation lies in the fact that after throwing the exothermic powder onto the surface, a slowly reacting exothermic briquette was then thrown after it, which drew off a certain quantity of heat from the surface. This opinion is completely confirmed by Figs. 21 and 24 of the feeder head of ingot No. 3, where heating with the exothermic briquette from above was so slow and inadequate that a shrinkage cavity was formed running deep into the body of the ingot. On the basis of the analysis of the results the following conclusions were drawn which confirmed this. It was shown that to attain high heating efficiency and obtain about 4 per cent. discard only, on large ingots heating from the side alone is insufficient, it being necessary at the same time to carry out heating from above. This confirmed the results given in the paper of Theis and Nitschke. It was necessary to develop a powder which would not affect the chemical composition in the feeder-head part of the ingot and that lying below it. We rejected the solution of using Thermit powder, which is certainly effective, but for known reasons is suitable for carbon steels only. We carried out a series of tests on a laboratory scale in order to establish the suitable composition of an exothermic powder containing aluminium. Some of the powders developed were tried out on a semi-production and production scale.

Very effective is the exothermic powder of composition: 50 per cent. granular Al material, 10 per cent. manganite, 35 per cent. sodium nitrate, 5 per cent. CaSi.

Part of the nitrate can be replaced by a neutral retarding addition of refractory oxides or substances and a suitable flux. With the same powder, packed in 2-kg. bags, we carried out a further experiment with VI A ingots. In all instances solidification of the feeder heads was influenced with a rammed exothermic lining, and from above with an exothermic powder containing aluminium. After teeming the exothermic mixture was thrown onto the surface in graduated quantities. Sections through the tops of the ingots after gas cutting are shown in Figs. 26 and 27.

During the use of exothermic powders containing aluminium of the composition given above, such an intense reaction and such an evolution of heat and dazzling sparks took place, that its industrial use on ingots of larger dimensions is dangerous for workmen and crane drivers.

Tests carried out on the macrostructure produced very unsatisfactory results and completely confirmed the opinion of the occurrence of inhomogeneity under an ingot feeder head when an exothermic powder containing ferro-alloys is used. Figs. 28 and 29 show a sulphur print and the microstructure of ingots from this melt. The weight of the feeder head was 3.4 per cent. of the weight of the ingot.

A further study of the properties of exothermic

FIG. 26.—FEEDER HEAD OF AN INGOT WITH SOLIDIFICATION INFLUENCED BY AN EXOTHERMIC LINING AND POWDER CONTAINING ALUMINIUM.

FIG. 27.—FEEDER HEAD OF AN INGOT WITH SOLIDIFICATION INFLUENCED BY AN EXOTHERMIC LINING AND POWDER CONTAINING ALUMINIUM.

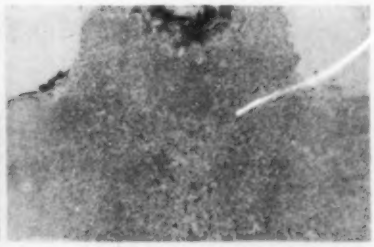

FIG. 28.—SULPHUR PRINT OF THE FEEDER HEAD OF AN INGOT WITH SOLIDIFICATION INFLUENCED BY AN EXOTHERMIC LINING AND POWDER CONTAINING ALUMINIUM.

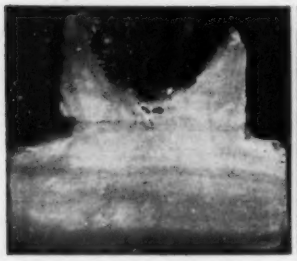

FIG. 29.—MACROSTRUCTURE OF THE FEEDER HEAD OF AN INGOT WITH SOLIDIFICATION INFLUENCED BY AN EXOTHERMIC LINING AND A MIXTURE WITHOUT THERMIT.

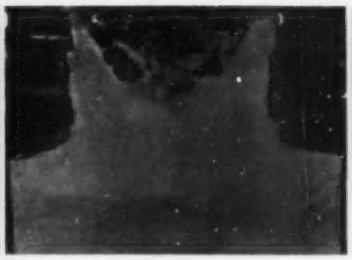

FIG. 30.—MACROSTRUCTURE OF THE FEEDER HEAD OF AN INGOT WITH SOLIDIFICATION INFLUENCED BY AN EXOTHERMIC LINING AND A POWDER CONTAINING ALUMINIUM WITH A LOW REACTION RATE.

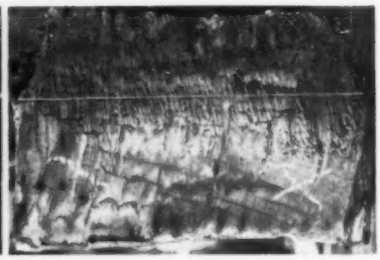

FIG. 31.—FEEDER HEAD OF A 2.4-TON INGOT WITH SOLIDIFICATION INFLUENCED BY AN EXOTHERMIC LINING AND POWDER CONTAINING ALUMINIUM.

materials with a high Al content, carried out for another purpose, explained the factors which govern the sequence of combustion of aluminium without an addition or with only a very small addition of aluminium oxide, and in this way the use of powders containing aluminium with a low rate of reaction was made possible. With these powders there is also no occurrence of dazzling showers of sparks.

The use of an exothermic, rammed lining in combination with the same powder has produced very good results. The macrostructure of the feeder head of a VI A ingot (Fig. 30), and likewise the chemical analysis of borings, confirm that no change took place in the chemical composition of either the feeder-head part of the ingot or that below it. The weight of the feeder head was 4.2 per cent. of that of the ingot.

It is evident that the method of influencing feeder heads of ingots by means of exothermic, rammed linings may also be successfully used for ingots of medium size with simultaneous heating from above, and that it is very effective.

In Fig. 31 is shown a section through the head of a forging ingot weighing 2,400 kg. after gas cutting; solidification was influenced by an exothermic, rammed lining of the same composition as in the preceding experiments and with exothermic powder containing aluminium. The purpose of this experiment was to test the effect of the cross-section between the feeder head and the body of the ingot on the weight of the feeder head and the shape of the surface of the feeder head. In accordance with assumptions the surface of the feeder head is completely level. Normal feeder heads weigh 16 per cent., and feeder heads whose solidification has been influenced weigh 9 per cent. of the weight of the ingot. The height of the feeder head may be decreased by 40 to 60 per cent., *i.e.*, to 5.4 to 3.6 per cent. of the weight of the ingot. The result is therefore almost the same as during the use of narrow feeder heads.

Economic Analysis of the Use of Exothermic Inserts

If we take into account an average decrease in the weight of an ingot of 10 per cent., *i.e.*, about 410 kg. steel for one ingot, for 10 ingots teemed from one melt the saving is 4,100 kg. steel. From the metal saved it is possible to teem one additional ingot of the same size, which represents a real increase in the output of molten steel.

The consumption of exothermic, rammed lining material is 9.1 kg./ton, that of exothermic powder 1.8 kg./ton, and the specific consumption of aluminium is 2.7 kg./ton. In the light of the output figures this consumption is low. The cost of the

FIG. 32. — UNENCASED INGOT HOT TOP, MADE UP OF FOUR DOUBLE-LAYER, EXOTHERMIC SHAPED BRICKS.

FIG. 33.—TEEMING STEEL INTO AN INGOT MOULD FITTED WITH AN UNENCASED HOT TOP.

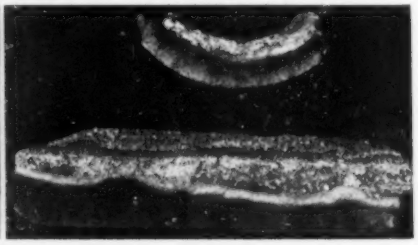

FIG. 34.—EXOTHERMIC SHAPES WITH AN INSULATING LAYER: AFTER THE REACTION.

raw materials for the exothermic, rammed lining is 1.74 Kcs/kg. and the cost of those for the exothermic powder containing aluminium is 3.93 Kcs/kg. If we convert this to the real consumption for influencing the solidification of a ton of steel, we have: rammed lining 15.85 Kcs/ton, powder 7.15 Kcs/ton, *i.e.*, the prime costs per ton of treated steel amount to 23 Kcs/ton.

If this method is restricted only to the most expensive steels to produce, the saving per ton of rolled products amounts to more than 320 Kcs/ton. If we use sleeves of perforated sheet for ramming the exothermic inserts, which are then produced in workshops without mechanization, the saving is reduced to about 300 Kcs per ton.

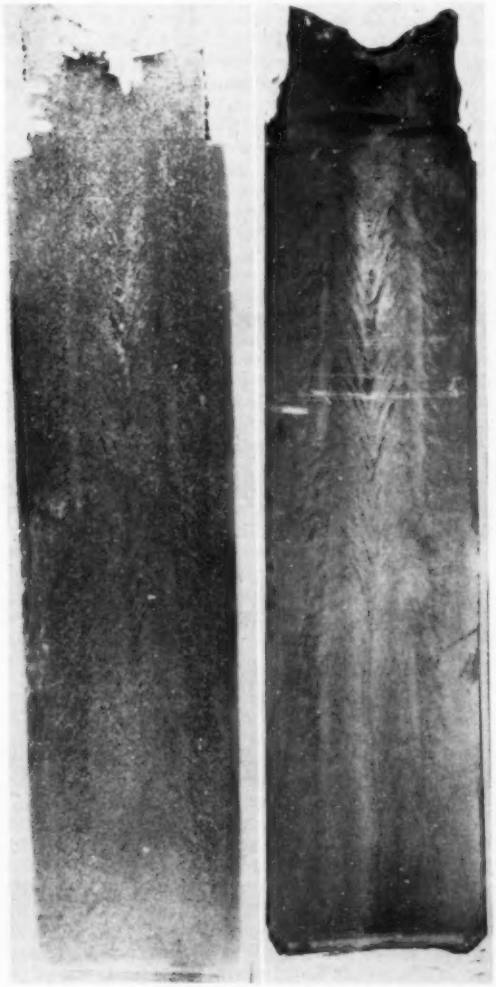

FIG. 35.—SULPHUR PRINT (LEFT) AND MACROSTRUCTURE (RIGHT) OF AN INGOT, WHERE SOLIDIFICATION OF THE FEEDER HEAD WAS INFLUENCED BY THE USE OF WEAKLY EXOTHERMIC SHAPES.

As has already been shown earlier, the method employed for the production of the exothermic, rammed linings was chosen as the fastest and most readily available solution, which alone permitted us to carry out production experiments within relatively short periods of time, and so fulfil the primary task—the determination of the most suitable composition for the exothermic material. The suggested production method can be used only for a small part of the production of alloy steels.

Use of Shaped Bricks for Influencing the Solidification of Ingot Feeder Heads

For influencing the solidification of ingot feeder heads it is possible to use simple shaped bricks in the form of an unencased hot top or even bricks reinforced with a metal casing. The best known are the so-called Vallak plates[15] of granular coke material equipped with a coating to retard the reaction. By means of Vallak plates in conjunction with exothermic powder a weight of the feeder head was obtained amounting to 7 per cent. of the total weight of the ingot. The disadvantage is the possibility of carburization of the steel and secondly limited application; simple plates can only be placed in ingot moulds with plane walls without any rounded sections.

In accordance with our suggestion[16] for the production of shaped bricks it is possible to use the outstanding properties of hardenable artificial resins; the bricks can be used in the form of an unencased hot top or better still for lining a steel plate or cast casing. In order that this method shall be generally applicable, it is expedient to choose simple geometrical shapes, for instance, plates, prisms, etc. The shaped bricks can with advantage be made of various qualities:—(1) Bricks containing for the most part moderately exothermic substances and insulating substances; (2) bricks containing very effective exothermic additions; (3) two-layer or multi-layer bricks containing an insulating, protective layer, and a strongly exothermic layer. Above all, economic grounds determine the advantages of the use of the individual types of bricks.

In all instances use has been made of hardenable synthetic resins, both modified and unmodified, for binding the material of the shaped bricks, either in the form of a solid substance or a solution. The bricks can be produced either hot or cold, or the two methods can be combined.

(1) In the first instance, to the basic substance containing as the binder phenol-resol synthetic resin are added substances of an acid nature or substances which split off acids, thus making hardening possible at normal temperature.

For this purpose we studied the cold hardening of synthetic resins. For hardening use was made of sulphuric, hydrochloric, boric, oxalic, phosphoric, phenolsulphonic, and cresolsulphonic acids, aluminium chloride, etc. Very good results were obtained with phenolsulphonic, phosphoric, and sulphuric acids. At the time the experiments could

not be carried out on the required scale; nevertheless, however, the results obtained are satisfactory. For instance, a mixture of refractory fillers (of burnt shale) with a 5 per cent. addition of synthetic resin and an 8 per cent. addition of phenolsulphonic acid had a strength of 280 kg./ cm.^{2}

(2) By the second method the substance containing synthetic resin is hardened by heat in a heated mould during the actual compacting process.

(3) By the combined method, which promises to be the most productive, the substance bound by hardenable synthetic resin is shaped at normal temperature, and its hardening is accelerated by supplementary drying at temperatures of up to 300 deg. C. After 10 minutes' drying of experimental specimens of exothermic materials with a 3.5 per cent. addition of binder, strength values exceeding 500 kg./cm.^{2} were attained, and these values are not final. They are dependent on the quality of the components and their particle size.

FIG. 36.—INGOT AND FEEDER HEAD, WHERE SOLIDIFICATION WAS INFLUENCED WITH TWO-LAYER SHAPES.

Experimentally we teemed two ingots weighing 650 kg. into moulds equipped with unencased hot-tops composed of plates produced in accordance with the suggestion described above. In Fig. 32 is shown the unencased hot top of an experimental ingot, Fig. 33 shows teeming in progress, and Fig. 34 the two-layer bricks after the reaction. In both instances exothermic powder containing aluminium was thrown onto the meniscus of the metal. The weight of the feeder head of the first ingot was about 7 per cent. of the weight of the ingot, for which single-layer plates of moderately exothermic, reacting substances were used, while in the second instance the weight of the top was practically nil. Fig. 35 and 36 show cross-sections of the experimental ingots after gas cutting.

From the first results it is evident that the suggested method of influencing the solidification of ingot feeder heads will have good results so far as the output of steel is concerned. In the meantime, it is impossible to determine the specific consumptions of the materials with accuracy on the basis of these experiments, but it is probable that the consumption of exothermic additions can be very well controlled for the production of the bricks and will be lower than for exothermic rammed linings. A further advantage of the bricks is the possibility of production outside a steelworks, their unlimited time of storage, and especially their good resistance to handling. It will be possible to produce bricks of varying degrees of effectiveness and at differing prices; for unalloyed steels without costly exothermic additions, and for alloy steels with strongly exothermic additions in order to attain the maximum output.

Conclusions

We have obtained detailed information on various methods of influencing the solidification of ingot feeder heads by means of exothermic powders and linings. Exothermic powders may be classed in three groups according to basic composition. The suggested powders do not contain Thermit and do not form products after the reaction which affect the composition of the steel, do not give rise to intensive occurrence of dazzling sparks, and transfer the predominant part of the liberated heat to the liquid steel in the feeder head of the ingot; on the metallurgical and economic side they are the most advantageous, and their introduction and increased use in steelworks is therefore very appropriate. A further increase in output can be expected through the use of insulating materials as linings or rammed linings of ingot hot tops.

The use of exothermic inserts for large ingots is possible only on a smaller production scale, namely,

for special quality steels, where it brings a certain increase in output by comparison with exothermic powders.

We have also developed a production method for shaped bricks for influencing the solidification of ingot feeder heads. The bricks contain both insulating and exothermic materials, and by the use of synthetic resins very good mechanical properties have been attained. These shaped bricks make possible the teeming of smaller ingots with practically the minimum top discard.

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[14] L. Smrha, Hutnické Listy, 1959, No. 12, p. 1,039.
[15] Czygen, Iron Age, Sept. 12, 1957, p. 123.
[16] Czechoslovak Patent Application PV-3759.

New Literature

CATALOGUES, house magazines, brochures, and other publications referred to below are usually available to our readers on request. Application should be made to the address given, mention being made at the same time of this journal.

DELORO STELLITE, LIMITED, Stratton St. Margaret, Swindon (Wilts)—The uses of "Stellite" alloys in many fields are outlined in a new brochure. The names and addresses of service engineers in the UK and of overseas representatives are included.

HADFIELDS, LIMITED, East Hecla Works, Sheffield 9—Publication No. 466.S, "Steel Castings Specifications," details all the current British and American (ASTM and SAE) standard specifications for steel castings, while a selection of European and Swedish castings specifications similar to the carbon steel specifications of BS 3100 is also given.

GRIFFIN & GEORGE, LIMITED, Ealing Road, Alperton, Wembley (Middx)—A 20-page brochure describing a new gas chromatograph, the D.6, is printed in three languages. It contains photographs, diagrams, and typical chromatograms produced on this highly specialized instrument.

GRÄNGESBERG COMPANY, Stockholm—A 60-page booklet produced by this organization represents a guide to the many activities of the company, which consists of five divisions—mining and power, iron and steel, railway and port, shipowning, and the Liberia division. These activities are described in some detail and excellent photography, much of it in colour, enhances the appearance and value of the publication.

DORMAN LONG & COMPANY, LIMITED, Zetland Road, Middlesbrough—Group activities are reviewed in words and pictures in the 1961 edition of Dorman Long Illustrated, a 20-page publication. E. T. Judge, chairman and managing director of the parent company, says that the past year has been marked by a falling off in the demand for steel products despite an increased volume of work obtained by the structural engineering subsidiaries against keen competition. "A return to a more satisfactory and sustained level of operations," he writes, "depends largely upon improving further our competitive strength."

GEORGE COHEN 600 GROUP, LIMITED, Wood Lane, London, W.12—Whatever Father Christmas brings us, one item of literature will engage our attention during the festive season—the Christmas number of the "600" Magazine. It is already here, but there will be no time for more than a cursory glance before the turkey has been digested. The 100 pages are packed with stories, articles, and a host of other features, including a generous helping of cartoons and other illustrations, many of them in colour. There is also money to be won—18 guineas in prizes in a "Popping the Question" competition. If you are fortunate enough to have a copy of the "600" Magazine, take it home so that the pleasure may be shared.

IMPERIAL CHEMICAL INDUSTRIES, LIMITED, Imperial Chemical House, Millbank, London, S.W.1—We have often referred to the magnificent colour reproductions in the ICI Magazine (2d.). Some of those in the December number are exceptionally attractive, especially those used to illustrate "Another Man's Christmas," in which M. T. Roberts, chef to ICI House, arouses one's appetite for Christmas fare. The article on "The Export Crisis—and Ourselves," by S. P. Chambers, the ICI chairman, hardly falls into the category of Christmas reading, but it is something to be read and digested. He asks (and answers) such questions as: "Why does Britain suffer one balance of payments crisis after another?" "Why is it right to join the Common Market?" "How is ICI affected by the present economic situation?" Good, meaty stuff, but not to be taken with turkey and Christmas pudding.

Workshop Practice for Fitters

COMPILED by the training branch of the National Coal Board and published by the University of London Press, Limited, the second edition of "Notes for Fitters" provides an introduction to workshop practice for mechanical engineering students in the elementary stages of their training. The book caters particularly for students who are preparing for examinations in mechanical engineering craft practice.

The first section gives brief notes on the properties, manufacture, and uses of metals and alloys and describes screw threads, bolts, nuts, nut-locking devices, cap screws, set screws, and studs. Marking and measuring instruments are dealt with in the second section, while the third section describes the proper use of cutting tools. Assembly tools, precision instruments, and general equipment are covered in the next three sections, and the last section gives an introduction to the centre lathe.

Test questions at the end of each section are modelled upon those set in the written papers for the first (and, in a few cases, the second) year examinations in mechanical engineering craft practice by the City and Guilds of London Institute, Northern Counties Technical Examinations Council, Union of Lancashire and Cheshire Institutes, and the East Midlands Educational Union.

Copies of the book (price 8s. 6d.) can be obtained from University of London Press, Limited, Little Paul's House, Warwick Square, London, E.C.4.

HEAVY-DUTY

AIR COMPRESSOR

LATEST addition to the range of air compressors of the air power division of Joy-Sullivan, Limited, Greenock, the RE.600, is an electrically driven, two-stage, rotary vane, oil-flooded type compressor with a free-air delivery of 600 cu. ft./min. at 100 lb./sq. in. gauge. Maximum operating pressure is 120 lb./sq. in. gauge. Designed for heavy-duty applications, the RE.600 (Fig. 1) is mounted on a robust channel section steel skid, with or without rail wheels, and is particularly suitable for underground operations in which the demand is for an easily moved compressor that can be kept close to the working face.

Because the compressor can be moved directly into the working area, air pressure at the face is appreciably higher than when piped from a distant permanent installation of similar working pressure and capacity. Leakage and friction losses in the piping are reduced to a minimum and there is no necessity for a bulky air receiver.

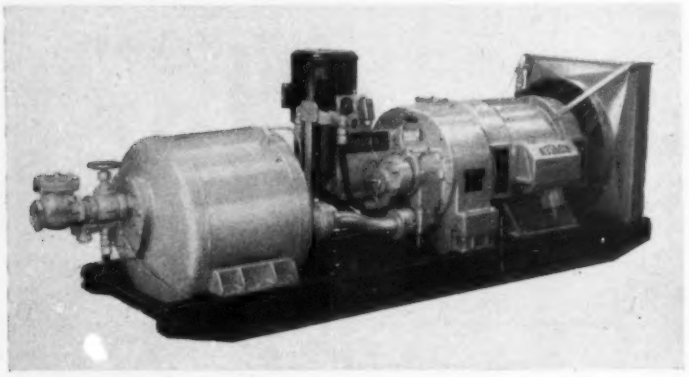


FIG. 1.—JOY-SULLIVAN RE.600 HEAVY-DUTY ROTARY AIR COMPRESSOR POWERED BY BRUSH 160-H.P. ELECTRIC MOTOR AS SUPPLIED TO DORMAN, LONG & COMPANY, LIMITED.

Design of the rotary vane type compressor unit is identical to that of the Joy "Airvane" portable compressor of similar capacity and incorporates a side-by-side cylinder arrangement housed in a one-piece cast-iron stator housing, with helical gear drive between low-pressure and high-pressure rotors. Full provision is made to prevent rotor end play, while allowing for expansion and contraction. A hardened bevel on the trailing edges of the rotor slots minimizes vane wear and the counter-bored cylinder ensures adequate internal air sealing.

Compressor and electric motor are coupled as a compact unit in an oil-flooded gearbox designed for heavy-duty operation. Helical gearing gives a speed increase of 0.77:1. No clutch is required between electric motor and compressor.

Brush electric motors fitted to the RE.600 develop a maximum of 160 b.h.p. at 1,440 r.p.m. A choice of squirrel cage screen protected, totally enclosed fan cooled, or totally enclosed flameproof motors can be supplied to Buxton certified standard. Voltages are 440 to 600 and 2,750 to 3,300, 50 cycle supply. The motors are specially designed and incorporate a flange for direct mating to the gearbox.

A positive displacement gear-type pump driven by the high-pressure rotor shaft provides flood-lubrication for the compressor and feeds all moving parts, including the drive gears. Air temperature is effectively lowered by the oil, which also acts as a compression seal between vanes and cylinder walls. The oil is cooled continuously by passing it through a tubular-type, fan-cooled heat exchanger. The oil is removed from the air in several stages and before discharge is passed through a fibreglass air/oil separator mounted inside the air receiver. A highly efficient air-intake filter is fitted and full-flow oil filters are included in the lubrication system.

The RE.600 has a safety circuit, which will stop the compressor should the air-discharge temperature exceed 225 deg. F. Units can operate safely in ambient temperatures up to 125 deg. F. More elaborate safety systems can be fitted to meet particular requirements.

The control panel mounted on the compressor provides visual readings of interstage and final discharge air pressures, and discharge air temperature. An air-operated pilot valve assembly is incorporated for easy adjustment of air discharge pressure.

For easy transportation in restricted spaces in mines, tunnels, and pit shafts, the skid mounting of the standard model is designed so that it can be split into two sections, one carrying the compressor, heat exchanger, electric motor, and gearbox, the other carrying the air receiver, air/oil separator, filters, and accessories.

Siting of the air receiver is arranged to facilitate access to the pipe manifold and permit easy removal of the air/oil separator.

The compressor runs at constant speed and unloading is effected by a totally closed inlet valve assembly controlled by an air-operated pilot valve. The compressor oil capacity is 26 gal. and its overall length is 11 ft. 6 in., its width 3 ft., and its height 4 ft. Weight, including skid base, is 5,630 lb.

"MODERN COAL PREPARATION," a film made by Nortons-Tividale, Limited, Tividale, Tipton (Staffs), several years ago, continues to be in regular demand. Extra copies of the film have, in fact, been provided; they are available on loan.

THIN-KERF CUTTING

at Longwall Faces

DEMAND for large coal makes it necessary in all chain-cutting operation, particularly in thin seams and when pre-cutting to assist face mechanization, to consider the thickness of the kerf to minimize the proportion of small coal being produced. The kerf of a coal-cutter chain is mainly determined by the thickness of the jib for which it has to cut clearance, and the normally constructed jib, with top and bottom plates, usually cuts a kerf of 5½ to 6 in.

In order to minimize the production of coal fines, Austin Hoy & Company, Limited, Saunderton, High Wycombe (Bucks), has designed a thin-kerf jib to remove only 3¼ in. of the section of the seam. Such a substantial reduction has entailed a completely redesigned jib and Fig. 1 illustrates how top and bottom cover plates have been eliminated, the jib being a channel section frame which dovetails on to a modified jib post shown in Fig. 2. Chain tensioning is by adjusting screw and block, but hydraulic tensioning, which reduces shock load in the chain, particularly on starting to cut, can be supplied if required.

The thin-kerf chain, shown in Fig. 3, which includes single- and double-pick boxes and connectors to form a five-line pick profile, is smaller in section than standard cutter chains, but the use of high-grade alloy steel, carefully controlled and accurately heat-treated, ensures ample strength for the high horsepowers of modern coal cutters and long life under abrasive conditions. The chain is driven by a multi-tooth sprocket which is smaller in diameter than the normal drive sprocket; alteration to the drive gears, using standard gear ratios, is therefore required to provide the correct chain speed. Modification of the back hanger ring of the coal cutter is also required to accommodate the thinner jib post, and it is recommended that they should be sent to the manufacturers' works for this operation.

The quantity of gumming produced by the thin-kerf unit is reduced by almost 50 per cent. Thus, in a 2-ft. 6-in. seam, where a 6-in. kerf represents 20 per cent. of the seam thickness, the proportion cut by the thin-kerf unit is under 11 per cent. In addition, the reduced gum pile allows better ventilation of the face and in thin seams facilitates travelling along the prepared face.

FIG. 3.—THIN-KERF CHAIN CONSISTING OF SINGLE- AND DOUBLE BOXES TO CUT A KERF OF ONLY 3¼ IN.

FIG. 2.—BACKHANGER RING AND JIB POST WHICH DOVETAILS INTO THE SPECIALLY DESIGNED THIN-KERF JIB.

In order to obtain the best results from machines fitted with Hoy thin-kerf units, it becomes even more essential that cutters should be fitted with a gummer bar and a gummer or gum stower. The maximum recommended depth of undercut for the thin-kerf unit is 5 ft.

During trials with the new jib chain it was noted that, although the cutting speed of the cutter was not increased, being limited by the haulage unit of the machine, both the load current to the electric motor and the rope tension were considerably reduced.

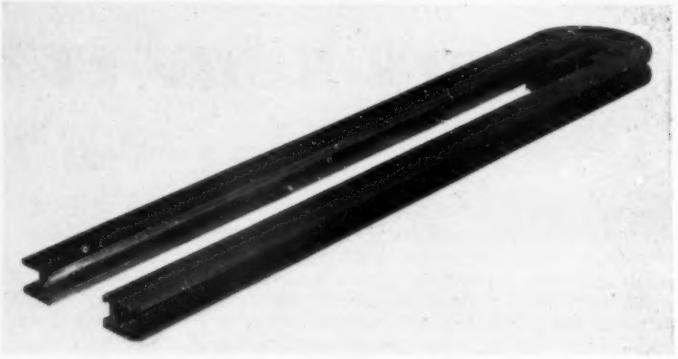


FIG. 1.—THE THIN-KERF JIB, ELIMINATING TOP AND BOTTOM PLATES AND WEARING STRIPS.

MOISTURE IN FABRIC USED IN CONVEYOR BELTING

THE operator is seen in the accompanying photograph adjusting the amount of moisture contained in fabric used in the manufacture of p.v.c. fire-resistant conveyor belting. This device, newly installed at the Leyland factory of BTR Industries, Limited, by the Baldwin Instrument Company, Limited, plays an important part in ensuring uniformity of stress distribution throughout the finished product.

Uniformity of stress distribution was also a feature of the textile weave used in some 4,500 ft. of p.v.c. belting supplied to the National Coal Board for its Pit House Drift installation in County Durham. This patented weave eliminates warp crimp, thereby enabling such fibres as continuous filament nylon to be used as tensile members on relatively long-centre drives.

Automatic Programming System for Steel Industry

NEW automatic programming system for steel rolling mills has been developed by the Metal Industries Division of the English Electric Company, Limited. The new system uses punched cards to store "rolling programmes," the complete sequence of screwdown, manipulator, and mill speed settings, and the number of passes in a rolling operation.

The system is an advance on the uniselector system introduced by the company two years ago. It offers a greater programme storage capacity than can be economically obtained with uniselectors. The benefits are the same: the operator, relieved of the routine rolling, can do his job better and more easily, producing during his shift more steel of more consistent quality. He can always take manual control to correct rolling faults. First installation of the new system is at the Hallside reversing billet mill of Colvilles, Limited, where it is controlling the screwdown.

PLANS FOR THE REVIVAL of the Chilean shipbuilding industry have been drawn up by Astilleros y Maestranza de la Armada (ASMAR). It is hoped to build ships of up to 8,000 tons by 1966.

Metallurgical Patents in the US

Some Recent Inventions

DESCRIPTIONS of metallurgical patents given below have been taken from details published in the Official Gazette of the United States Patent Office.

METHOD AND APPARATUS FOR HORIZONTAL POURING OF METALS

A device for the continuous horizontal pouring of metal shapes comprises a container for liquid metal, a side wall on the container fabricated from asbestos, and an opening in the side wall for discharge of the liquid metal. A horizontal chill mould has an inside bottom wall, and an outlet conforming in cross section to approximately that of the metal shape, the chill mould having a rearwardly extending continuous lip which is pressed into the asbestos side wall to form a liquid-tight connection between the container wall and the chill mould, the mould being adapted to chill the liquid metal to form a solid annular bead of metal within the chill mould which becomes detached to form the outer surface of the metal shape. The opening is below the central horizontally extending axis of the chill mould and above the inside bottom wall, and in such location that the annular bead forms in a plane substantially perpendicular to the axis of the chill mould, which has walls forming an internal cooling cavity, and means for supplying fluid to the cavity.—2,996,771.

VACUUM CASTING APPARATUS

The combination with a metal-teeming chamber including a side wall and a top, of a ceiling suspended therein adjacent the top comprising a frame including a circumferential rail and beams extending transversely thereof and secured thereto, and panels of thermal insulation substantially filling the spaces between the rail and beams. Hanger studs are secured to the beams and the top and centering brackets secured to the rail and bearing against the wall.—2,996,772.

CENTRIFUGAL REACTOR

A method of producing large quantities of heat at high temperatures within an unobstructed confined space formed by end walls having restricted openings in each wall and a generally cylindrical refractory wall. The method comprises rotating the walls at high speed, continuously introducing solid highly exothermic metal and oxygen into the space, while the walls are rotating, and melting the metal to form a molten mass, which is evenly distributed completely around the walls by their rotation to line the entire refractory wall with the molten exothermic metal and forming a continuous molten surface of distributed metal surrounding the confined space, vigorously vaporizing the metal over the entire distributed surface of the molten mass, feeding the confined space with highly exothermic metal vapour, while combining the metal with the oxygen within the space, and retaining at least a portion of the heat of combustion to raise the temperature of subsequent oxidation to produce large quantities of heat at a temperature above 1,500 deg. C. and at a superatmospheric pressure and exhausting the products of combustion from the space in a fine constricted high-velocity jet.—2,997,006.

SUSPENDED FURNACE ROOF BLOCK

A furnace roof block for suspension from a hangar having a cross bar at its lower end, the block comprising a pair of refractory bricks disposed on end side by side with the inner faces of their upper portions spaced apart to form a narrow socket adapted to receive a hanger cross bar, the opposite sides of the socket being provided with lateral recesses for receiving the ends of the bar when the hanger is turned, and a metal sheet engaging a side of a brick at an end of the socket and provided with an inwardly bent resilient tongue having a free end beside one of the recesses in the path of rotation of the adjacent end of the hanger bar to thereby prevent the bar from being turned out of the recesses and accidentally releasing the block, the angle between the tongue and the sheet at the side of the tongue opposite to the one recess being at least 90 deg.—2,997,008.

HOT TOPS FOR INGOT MOULDS AND METHOD OF MAKING THE SAME

A hot top for ingot moulds for making killed steel ingots, comprising a lightweight, fluid-permeable, monolithic, homogeneous self-supporting body consisting substantially of a granular refractory material bound by a silicate binder selected from the group consisting of sodium silicate and potassium silicate, more than 50 per cent. of the material being of a grain size within the limits of 0.4 to 2 mm., not more than 5 per cent. being of a grain size less than 0.2 mm., the remainder being of a grain size not greater than 5 mm.—2,997,758.

SHELL MOULDING MIXTURE

A moulding material for forming shell moulds consisting essentially of a major proportion of a comminuted refractory filler and a minor proportion of an organic binder containing 25 to 75 per cent. by weight of the reaction product of furfural and a thermoplastic resinous material derived from wood and containing both methoxyl and hydroxyl groups, a small but effective amount not in excess of 25 per cent. by weight of binder curing agent, and the balance substantially all novolak.—2,997,759.

CONTINUOUS VACUUM CASTING PROCESS

A continuous process for making devolatilized metal castings within vacuum apparatus includes a crucible and a vacuum chamber, the crucible being provided with an aperture opening into the chamber for withdrawing molten metal from the crucible. This comprised the following contemporaneous steps: maintaining a partial vacuum within the crucible at an absolute pressure between 10 microns and 1 millimeter of mercury; continually feeding into the crucible metal initially containing a substantial amount of volatile

matter; continually heating the metal within the crucible to the melting temperature of the metal, so that it continually evolves a portion of the volatile matter into the partial vacuum to produce partly devolatilized molten metal continually within the crucible. A high vacuum is maintained within the vacuum chamber at an absolute pressure of less than 1 micron of mercury; the said partly devolatilized molten metal being continually transferred through the aperture into an open-topped mould disposed directly below the aperture and within the vacuum chamber. Additional heat is supplied to the metal within the vacuum chamber by direct electron bombardment of the upper surface of molten metal within the mould, so that the metal continually evolves a remaining portion of the volatile matter into the higher vacuum to produce more highly devolatilized molten metal continually within the vacuum chamber; and vacuum casting the more highly devolatilized metal to produce devolatilized metal castings.—2,997,760.

METHOD AND APPARATUS FOR CASTING INGOTS

A pressure pouring apparatus of the type wherein liquid material is forced by the application of gas pressure against it from a pressure chamber of a container to a mould disposed without the container. A combination of the means for transporting the material from the pressure chamber to the mould, a vacuum chamber overlying and engaging a portion of the mould, first means separate from the transporting means affording direct communication between the respective chambers, first means including a valve, a vacuum source connected to the first means at a place between the valve and vacuum chamber, a pressure source connected to the first means at a place between the valve and the pressure chamber, and other means separate from the transporting means and first means also affording direct communication between the respective chambers.—2,997,756.

FOUNDRY MOULD

A mould for foundry purposes having a parting plane defining a cope and a drag and including gate cavities and casting cavities in communication with the gate cavities, both cavities opening into the parting plane, the cope having a lower surface situated in the parting plane and an upper surface above the parting plane, the cope comprising a plurality of sprues extending therethrough and having upper and lower ends, the sprues being connected over their lower ends with the gate cavities. A recess is provided in the upper surface at a location remote from the sprues and forming a pouring basin, and channel means in the upper surface and connecting the pouring basin with respective ones of the sprues, the upper ends of the latter, to thereby permit simultaneous distribution of molten metal, when poured into the basin, to the respective sprues via the channel means.—2,997,757.

TURN-OVER GEAR FOR USE WITH ROLLING MILLS AND THE LIKE

Turn-over gear arranged to be located between skid rails which receive rolled sections to be turned comprising, in combination, a turning member having first and second limbs set at an angle to one another, means having a pivotal connection with the member for raising and lowering at least part of the member past the skid rails from an initial position in which the member lies wholly beneath the skid rails to a position in which the second of the limbs projects above the skid rails. A pivot is at the free end of the first limb about which the member swings upwards to cause the second limb to project above the skid rails. Means operable after the operations of the raising means cause the pivot to rise in a substantially vertical direction, guiding the junction between the limbs to move substantially horizontally towards the vertical plane containing the pivot while this is moving upwards, the section being located in the angle between the limbs by the upward swinging of the member and turned through substantially 90 deg. of arc by said raising of the pivot and substantially horizontal movement of the junction, the pivot-raising means including a bar carrying the pivot, and a pair of parallel arms freely pivoted respectively about two fixed axes, said bar being pivoted to the arms.—2,998,888.

WELDING FLUX AND METHOD OF USING

A method of gas welding metals, which comprises supplying trimethoxyboroxine to one of the welding gases and burning the trimethoxyboroxine with the welding gases in the welding zone to produce a boric oxide flux.—3,001,276.

METHOD OF WORKING HARD BRITTLE METALS

A method of working sheet metal characterized by hardness and brittleness while cold and selected from the group consisting of titanium alloys, magnesium alloys, aluminium alloys and stainless steel, consists of hammering the sheet metal, while it bears on a supporting surface surrounding an interruption, at an area of the sheet metal registering with the interruption with a hammer having an elongated narrow work-engaging surface whose area is small compared to the area being hammered, while the metal is cold and substantially uniformly at a rate in the range between 400 blows/min. and 16,000 blows/min. and at a force less than the fatigue limit of the metal to deform the sheet metal at the hammered area, the hammer being continuously rotated to successively engage different parts of the area registering with the support interruption as long as the hammering continues and in a manner to contact all of the surface of the area registering with the support.—3,001,279.

ELECTRONIC WEIGHING FOR ARGENTINA STEEL PLANT

TWO Fairbanks Morse electronic weighing systems, which when completed will be among the largest and most fully instrumented of their kind in Latin America, have been ordered by Acindar Industria Argentina de Aceros, S.A., for the expansion of its steel plant under construction at Villa Constitución, Argentina. The equipment, costing over $30 000, is designed to weigh loads of up to 30 tons gross weight on tandem, end-to-end platforms, each nearly 40 ft. long and 4 ft. wide, at the back shear table of the double-sided cooling bed extension of an existing rod skelp and merchant rolling mill. The latest print-out equipment is being incorporated in the installation so that data recording and totalizing of daily output can be carried out automatically.

As lengths of sheared steel are fed onto the weighing platforms by conveyors, the electronic equipment will automatically print out weights, the number of loads handled that day, and other information required for permanent record.

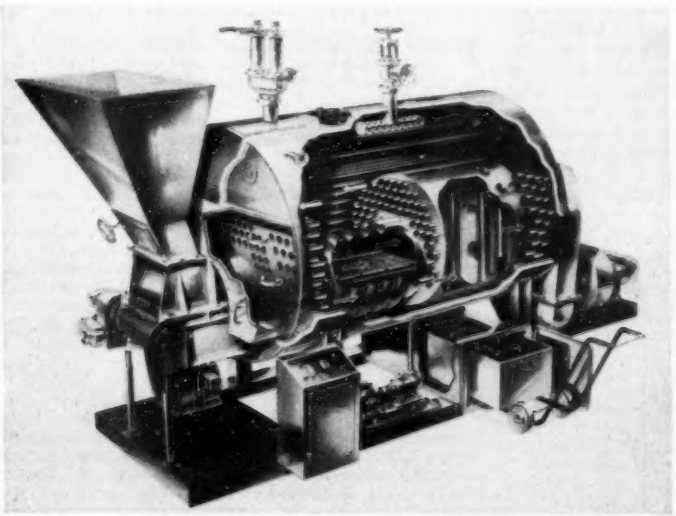
OPERATING ADVANTAGES OF *New Coal-fired Boiler*

AN automatic coal-fired boiler with coal and ash handling facilities which necessitate periodic attendance only has been produced by John Thompson, Limited, Wolverhampton. Offering operating advantages which have previously been associated only with oil-fired boilers, it was demonstrated at the recent Northern Exhibition of Fuel and Power, held in Leeds.

The new boiler has a wet-sided, dry-backed combustion chamber, with three gas passes to offer improved thermal efficiency, and, together with the fully corrugated flue, give maximum radiant heating surface. It can be supplied to comply with any coal handling arrangements, but the standard model has been designed for firing by a Mini-Stoker chain-grate stoker manufactured by John Thompson (Triumph Stoker), Limited. This stoker has a works-set low firing rate and an easily adjustable high firing rate which can be simply preselected by the operator to meet any expected load.

Changeover during operation between low and high firing is effected automatically by boiler pressure.

Ash is deposited directly into an ash box under the boiler by way of a water-cooled opening through the bottom of the combustion chamber and boiler shell. The boiler is produced in a number of sizes up to 13,000 lb./hr. F. and At., and can be offered suitable for a working pressure of 110 or 145 lb./sq. in. gauge. Tests have shown that efficiencies of over 80 per cent. are easily attained.



CUT-AWAY ILLUSTRATION OF THE NEW COAL-FIRED SEMI-WET BACK SHELL BOILER INTRODUCED BY JOHN THOMPSON (WOLVERHAMPTON), LIMITED.

Mechanization and Economic Coal Production

OUTLINING the trends in machine design, especially for the Anderton shearer, and machine application over the last few years, Mr. E. J. Daniell (mechanization department of the North-Western Divisional Coal Board), in a paper published in the 1961 journal of the Past and Present Mining Students' Association of the Wigan and District Mining and Technical College, concludes by commenting on the use of modern face mechanization methods.

The coal industry requires, he states, economic production obtainable from a combination of improved machine and equipment design, higher operating speeds leading in turn to longer faces limited rather by geological conditions than by armoured flexible conveyor design, and a wider use of the non-cyclic types of power loader which permit two-shift or even three-shift production per day. All these factors make it possible to obtain a higher bulk output per machine in operation, leading in turn to concentration of ouput.

Mr. Daniell also states that modern power loaders and their associated equipment, particularly powered support systems, are expensive and their maintenance requires skilled craftsmen above and below ground. It is therefore in the interests of management and its specialist services to get the utmost value by using the least amount of the best equipment to yield the most output.

In a further paper, Mr. E. Loynes, chief electrical engineer of the North-Western Divisional Coal Board, outlines the two main categories of planned maintenance—corrective and preventative—and indicates how these can be carried out in a systematic manner, not only in the interests of safety but also for the economic running of pits.

Other papers in this year's edition of the journal include "The Aims of Mining Subsidence Research," by Mr. R. F. Orchard, "Modern Winding Installations," by Mr. H. Hitchen, and "The Latest Development in the Production of Smokeless Fuel," by Mr. J. S. Harrison.

Industrial Quantities Measured Remotely

Availability in this country of the Dur-O-Pulse industrial data transmission system is announced by Honeywell Controls, Limited, Greenford (Middx), for straightforward or up to 24-channel multiplex transmission over long distances. It is for electricity, coal, gas, water, chemical, petroleum, steel, and other industries.

Brazil's Mineral Resources

IN contrast to Brazil's almost unlimited economic possibilities, its mining industry is at an early and precarious stage of development, it is stated in a survey of Brazil's mineral resources published in the August issue of the Conjuntura Econômica.

The absence of any serious, large-scale study of the country's mineral resources makes it virtually impossible for the Government and private enterprise to plan their development. It is estimated that Brazil has almost a hundred different minerals that could be economically exploited. Statistics of production are available for only 25 of these, many of which are still at an insignificant stage of development.

Between 1955 and 1960 production of iron ore increased from 3,400,000 tons to 10,000,000 tons; yet if the exceptionally favourable natural conditions for developing these reserves are taken into account, the present output must be considered disappointing. Reserves of "compact hematite" in the Minas Gerais area are alone estimated at 3,500,000,000 tons, to be found at depths varying from 50 to 100 m., while reserves of "Itabiriti" for concentration, at depths of 10 to 50 m., are estimated at 30,000,000,000 tons in that region and at 50,000,000,000 tons for the country as a whole. Despite these favourable conditions, however, during 1960 Brazil's output was less than 2 per cent. of total world production.

Production of manganese ore rose from 252,500 tons in 1955 to 918,000 tons in 1957, and has remained at about this level for the past three years. The rapid increase in production was because of the entry into operation of Indústria e Comércio de Minérios (ICOMI), a subsidiary of Bethlehem Steel, which accounts for about 78 per cent. of the country's manganese production. Minas Gerais and Bahia account for 20 per cent. of the total and Mato Grosso for the remaining 2 per cent. Known manganese mineral deposits, with a metallic content of over 42 per cent., are 90,200,000 tons, of which 25,000,000 tons are located in Amapá, 55,000,000 tons in Urucum in Mato Grosso, 7,700,000 tons in Minas Gerais, and 2,500,000 tons in Bahia. In addition to these reserves, however, it is estimated that large deposits with a lower metallic content exist in Minas Gerais and that these have not yet been properly surveyed. In 1957-59 Brazil occupied third place in world manganese production, after the USSR and India.

Table I gives details of Brazil's production and exports of iron and manganese ores between 1955 and 1960.

TABLE 1.—*Production and Exports of Iron and Manganese Ores in Brazil*, 1955-60.

Year.	Iron ore.			Manganese.		
	Production.	Exports.		Production.	Exports.	
	'000 tons.	'000 tons.	Million US$	'000 tons.	'000 tons.	Million US$
1955 ..	3,382	2,565	30 0	253	177	5 4
1956 ..	4,075	2,745	35 1	311	260	8.3
1957 ..	4,977	3,550	48 1	918	798	37 5
1958 ..	5,185	2,831	39 4	882	664	30 1
1959 ..	8,841	3,989	43 7	969	914	30 3
1960	10,000*	5,240	53 6	900*	866	29 8

* Estimates.

Development of Large Steam Turbine-Boiler Units

PRINCIPLES which have governed the development of large steam turbine-boiler units on the Central Electricity Generating Board's systems during the past decade are described in "Land Practice in Modern Steam Plant," a paper which F. Dransfield, B.Sc.(Eng.), and J. L. Gray, B.Sc., read at a meeting of the Institute of Marine Engineers on December 12. It outlines the differences between the basic requirements of plants for electricity supply and for marine propulsion and notes the effects of these on the major design features of central power station plant. The effects of the types of fuel available in Great Britain are also discussed.

The rapid growth of the electrical power demand has been satisfied economically by the use of units of increasing size and this has facilitated the employment of increasing steam pressures and temperatures. The limitations of the available materials and the thermal efficiencies attained are indicated. The design concepts governing the integrated boiler-turbine system, which is to be designed for rapid starting and loading are discussed. There then follows a detailed summary of the parameters governing the design of the boiler, the turbine, and the associated auxiliary plant. Typical designs are illustrated.

Argentine Steel Developments

PLAN presented by Industria Argentina de Aceros (ACINDAR) to enlarge and complete its plant at Villa Constitución, Province of Santa Fe, has been officially approved, according to the Bank of London and South America. The new plant will produce 600 000 tons of steel bars annually, which is 10 times more than its present output. The works and extensions to be carried out will include a complete steel mill and a blast furnace similar to that of SOMISA at San Nicolás, a dock on the river Paraná, a storage depot for iron ore and coke, and an electric power plant.

Work will begin early in 1962 and initial production may start in 1964. It is reported that output from the new steelworks and blast furnace will eventually represent a foreign exchange saving of US $50,000,000.

New Range of Totalizing Belt Weighers

A completely new range of totalizing belt weighers is announced by W. & T. Avery, Limited, Birmingham. These scales are adaptable to meet a wide variety of requirements for totalizing the weight of material passing over a conveyor belt. The machines are designed to fit into an existing conveyor system and are suitable for either horizontal or inclined installations.

THE COAL TRADE

VOLUME of business being handled by merchants is, because of the Christmas holiday, well above normal, and the main problem at the moment—and probably for some weeks to come—is to get suitable labour to deliver the orders being placed. It is also difficult to satisfy every customer's requirements, but there is a willingness to accept alternatives, providing reasonable delivery can be assured. The wisdom of the special efforts made earlier on to build up depot stocks as far as possible is now being proved.

YORKSHIRE

The retail trade is far busier than for many years and merchants are hard put to keep pace with the exceptional influx of orders. The labour shortage and the inclement weather, particularly fog, has made it virtually impossible to complete all orders before Christmas and it is interesting to note that orders are being received from customers who had previously notified their merchants that they had "gone electric."

The supply position indicates an increased demand in Group 3, Group 4, and Group 5 Doubles and in many cases these are being lifted from stock to satisfy consumer requirements, but in general supplies are reasonably available for this time of the year, with the less popular brands easy. The new landsale charges are bound to affect the retail price of many road-collected coals in the New Year.

Anthracite and Phurnacite supplies are still difficult, although perhaps a little easier than previously, and all cokes are in plentiful supply. In the industrial field a very strong demand is maintained; with supplies of washed smalls in west Yorkshire very difficult, and in south Yorkshire not as good as previously. Washed singles and washed doubles are available in small quantities, but in certain areas there have been small percentage cuts for smalls, singles, and doubles. Industrialists are advised to maintain their stocks as large as practicable as it is expected that early in the New Year the demand will be far greater than the supply of graded coals.

Higher Coal Exports from South Wales Ports

EXPORTS of coal, coke, and patent fuel from the South Wales ports in the four weeks ended December 3 reached 251,492 tons, an increase of 53,000 tons on the corresponding period last year. Exports of iron and steel manufactures also improved by 11,000 tons to 45,625 tons, while those of tinplate fell by 12,000 tons to 26,750 tons. Imports of iron ore during the four weeks fell by 20,000 tons to 304,448 tons, while imports of iron and steel goods also declined by 20,000 tons to 31,596 tons. Imports of pitwood and mining timber were down 13,000 tons to 13,789 tons.

Total traffic passing through the various ports during the period, with the figure for the corresponding period last year in parentheses, were: Newport, 181,851 (216,781) tons; Cardiff, 150,662 (166,314) tons; Barry, 84,643 (122,673) tons; Port Talbot, 231,122 (229,348) tons; Swansea, 440,105 (622,634) tons; Penarth, 21,901 (28,469) tons; Lydney, 2,164 (1,601) tons.

HAMWORTHY ENGINEERING, LIMITED—Mr. L. Thomas has been elected a director.

Bull Week Boosts Coal Output

BULL week in the coalfields produced the expected result—a surge in output to 4,307,500 tons, nearly 200,000 tons better than the previous week and 120,000 tons up on the corresponding week last year. Manpower since 1960 has dropped by 22,400 overall and by 10,730 at the face.

Inroads continue to be made into consumers' stocks which dropped 400,000 tons in the week ending December 9 to 17,633,000 tons. There was also a drop of nearly 100,000 tons in undistributed stocks. Consumption remained at the high level of 4,500,000 tons, compared with total output of 4,100,000 tons.

There were 561,770 wage-earners on colliery books on December 9, against 584,180 on December 10, 1960, the numbers engaged at the coal face being 209,980 and 220,710 respectively. Output at the face was 4.364 tons and overall 1.529 tons in the week ended December 9, compared with 4.052 and 1.432 tons in the week ended December 10, 1960.

The following table gives (in tons) the provisional figures of output of saleable mined coal by division in the week ended December 16, and the tonnage lost through disputes:—

Division.	Week ended December 6, 1961.		Week ended December 7, 1960.
	Total output.	Tonnage lost.	Total output.
Scottish	378,000	2,000	354,000
Northern (N&C) ..	257,000	—	258,000
Durham	480,000	—	481,000
North-Eastern ..	941,000	2,000	934,000
North-Western ..	262,000	—	265,000
East Midlands ..	1,017,000	—	948,000
West Midlands ..	326,000	—	302,000
South-Western ..	405,000	1,000	409,000
South-Eastern ..	34,000	—	35,000
Great Britain—			
Deep-mined coal ..	4,100,000	5,000	3,986,000
Open-cast coal ..	163,000	—	161,000
Other deep-mined (including licensed mines) ..	45,000	—	38,000
TOTAL ..	4,308,000	5,000	4,185,000

THE COURT OF APPEAL has allowed an interlocutory appeal by Mr. Patrick Noel Dornan from an order of Mr. Justice Winn at Newcastle Assizes, by which he refused the plaintiff leave to amend his statement of claim for damages for negligence against his employers, James W. Ellis & Company, Limited, constructional and industrial engineers, etc., of Swalwell (Co. Durham) on the ground that more than three years had elapsed since the accident and that the amendment raised a fresh cause of action.

Accommodation for 1962 NACM Conference

ANNUAL conference for 1962 of the National Association of Colliery Managers will be held in Cardiff on May 23, 24, and 25. Theme of the conference will be "The Effective Utilization of Manpower." Members are advised to reserve accommodation well in advance and, to help them in this respect, a list of hotels is given below. Members should state when booking that they are attending the NACM conference.

CARDIFF—Angel; Park; Sandringham; Grand; Bristol; Alexandra; Philharmonic; Llandaff; Central (unlicensed); Royal.

NEWPORT (12 miles)—Kings Head; Westgate.

BARRY (10 miles)—Barry; Claremont (unlicensed); Eastcote Guest House; Mount Sorrel; Ship.

PENARTH (five miles)—Esplanade.

BRIDGEND (19 miles)—Wyndham; Dunraven.

COWBRIDGE (13 miles)—The Bear.

PORTHCAWL (26 miles)—Porthcawl; Brentwood; Esplanade; Sandville (unlicensed); Seabank; Westward Ho! (unlicensed).

The following is a list of private hotels, guest houses, and other accommodation in Cardiff:—

Downside Private Hotel, 122, Newport Road; Sunbury Private Hotel, 124, Newport Road; Coleshill Private Hotel, 142, Newport Road; Glenmor Private Hotel, 150/153, Newport Road; Linden Court Private Hotel, 191, Newport Road; Ashgrove Private Hotel, 272, Newport Road; Browning Private Hotel, 50, Oakfield Street, (off Newport Road); Ellin Cliffe Private Hotel, 160, Cathedral Road; Beverley Private Hotel, 75, Cathedral Road; Courtfield Private Hotel, 101, Cathedral Road; Dorville House Private Hotel, 3, Ryder Street; Parklands Private Hotel, 49, Ninian Road; Penylan Private Hotel, 82, Penyland Road; Langford Private Hotel, 14, Richmond Road; "Fifty" Private Hotel, 50, Richmond Road; Holmesdale Private Hotel, 138, Newport Road.

Phillips Commercial Hotel, 154, Colum Road; The Laurels Commercial Private Hotel, 138, Cathedral Road; Cedars Commercial Private Hotel, Fidlas Road, Llanishen.

Hazelmere Guest House, 60, Park Place; Lyndhurst Guest House, 13, Colum Road; Arcos Guest House, 8, Merches Gardens; The Guest House, 160, Richmond Road; Monkstone Guest House, Newport Road, Rumney; Roath Park Café and Guest House, Fairoak Road; Hillside Hotel Club, Ty-Gwyn Road, Penylan; Clayton Guest House, 65, Stacey Road, Roath; Romilly Guest House, 77, Romilly Road, Canton.

Mr. and Mrs. Rorke, 93, Newport Road; Mrs. Haw, 365, Newport Road; Mrs. Evans, 11, Colum Road; Mrs. Lawson, 163, Cathedral Road; Mrs. Begg, 36, Hamilton Street (off Cathedral Road); Mrs. Herdn, 11, Dyfrig Street (off Cathedral Road); Mrs. Collins, 19, Berthwin Street (off Cathedral Road).

A CAROL SERVICE will be held today (Friday) at the pit bottom in the Redbrook section of Dodworth Colliery, near Barnsley (Yorks). The singing will be conducted by Mr. Arthur Hoyland, a retired deputy of the colliery, and will be accompanied by Mr. Isaac Stanley (violinist), a machineman on one of the pit's mechanized faces, and members of the Dodworth Miners' Welfare Band.

"Serious Effects" of Rise in Coal Prices

FOLLOWING its meeting last week to consider the National Coal Board's proposals for increases in the prices of certain industrial coals from January 1, the Industrial Coal Consumers' Council states that bearing in mind the financial and economic obligations put on to the nationalized industries, it feels in no position to reject the proposals.

The council, however, has drawn the attention of the Minister of Power, Mr. Richard Wood, to the risks involved in any increases of fuel prices at the present time, and the "very serious effects" the selective increases will have on industrial consumers in Scotland and, to a lesser degree, in the north-west, as well as on industrial users of large coal generally.

The council points to the discriminatory nature of the increase in price of large coal which, for the time being at least, will only affect the industrial user and not the domestic user, and urges on the Minister the "importance of distinguishing clearly between the social and economic implications of the policy behind such price increase, and of dealing with the social implicatons by other than commercial means."

Marketing Director for South-Western NCB

MANAGER of the general branch of the marketing department at the National Coal Board headquarters, Mr. H. R. Hodgson has been appointed marketing director of the South-Western Division of the NCB in succession to Mr. D. F. Pexton, who retired in October. Mr. Hodgson was born in Cumberland in 1909. He was educated at Manchester University and subsequently qualified as a solicitor. After service in the Board of Trade Solicitors' Department, principally on work for the then Mines Department, he joined in 1937 the staff of the executive board of the Statutory Coal Selling Scheme for the coalfields which now comprises the board's North-Eastern and East Midlands Divisions.

Mr. Hodgson entered the service of the Coal Board in 1946 as departmental secretary of the board's marketing department at headquarters, and in 1954 was appointed manager of the general branch in that department.

Pit Overman is Appointed Undermanager

SENIOR overman at Hilton Main Colliery, No. 2 (Cannock Chase) Area, West Midlands Divisional Coal Board, Mr. G. E. Steed, has been appointed undermanager at Highley Colliery, in the No. 3 (South Staffordshire and Shropshire) Area of the Division. He gained his mining experience from 1948 to 1957 at Hilton Main Colliery, where he became a deputy.

After a period as a directed practical trainee, Mr. Steed returned to Hilton Main, remaining there until his present appointment. He holds a first class certificate of competency, is an associate member of the Institute of Mining Engineers and a member of the National Association of Colliery Managers.

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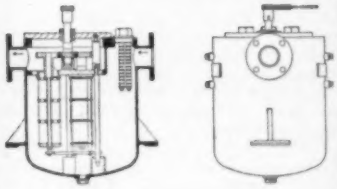

Advantages: (1) Full flow filtration. *All* the liquid passes through the filters to the *clean* side of the system. (2) Low pressure loss, ensuring high efficiency. (3) Self cleaning without dismantling or interrupting the flow. Two turns of the handle are all that is necessary. (4) Long life—lasts the life of the engine or plant. (5) Saves space and weight—large capacities relative to size.
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A range of filters is also available for varying applications and flows up to 150,000 gallons per hour.

Law Cases

Trade Witnesses in Magnets Hearing

TRADE witnesses appearing for the Registrar of Restrictive Trading Agreements gave evidence on the effect of the price agreement of the Permanent Magnet Association in the Restrictive Practices Court last week. The Court has to decide whether the agreement is in the public interest. The witnesses included Mr. R. W. Stobbs, a divisional manager of the Plessey Company, Limited, and general manager of Preformations, Limited; Mr. J. C. Tattersall, a director of Meccano, Limited; Mr. Kevin Hughes, joint managing director of Goodman's Industries, Limited, and Mr. T. S. Yorke, a special director (purchasing) of S. Smith & Sons (England), Limited.

In his closing speech, Sir Frank Soskice, QC, for the Registrar, suggested that the association had to show that as a result of the price restriction the information pooling arrangements used by the companies had produced a benefit. He submitted that on the evidence it was impossible to show that the pooling resulted from the price restriction.

Sir Frank maintained that if members of the Association had been allowed to charge what they wanted, the public would have got magnets at lower prices. He suggested that even if the price fixing arrangement was ended by the Court, the pooling would not be discontinued. One or two of the bigger companies might withdraw. The smaller companies might band together and continue to defend themselves against outside competition.

Recent Wills

JONES, G. A., for many years proprietor of Kingswood Colliery (Staffs), and former secretary of the Association of Cannock Chase Small Mines ... £13,102

MOLE, SAMUEL, chairman and governing director of S. Mole & Sons (Green Lane Foundry), Limited, engineers and ironfounders, of Stourbridge (Worcs) £21,833

WOODHOUSE, N., director of Joseph Woodhouse (Chains), Limited, manufacturers of electrically-welded chains, cables, and anchors, of Cradley Heath (Staffs) £54,662

GRIFFITHS, J. H., joint managing director of T. & C. Clark & Company, Limited, manufacturers of glass-lined steel equipment, etc., of Wolverhampton (Staffs) £14,511

PARRAMORE, ERNEST, chairman and managing director of F. Parramore & Sons (1924), Limited, ironfounders, etc., of Sheffield, and son of the founder of the company £54,421

RICHARTZ, P. P., chairman and joint managing director of Richards Bros. & Sons, Limited, cutlery manufacturers, of Sheffield. Mr. Richartz founded the firm in 1932 ... ... £80,668

MARTIN-HARVEY, T. H., formerly chairman of Metropolitan Electric Cable & Construction Company, Limited, manufacturers of electric cable and wire, of Romford (Essex) £54,759

PERRY, F. B., director of Robey & Company, Limited, engineers and boilermakers, iron and alloy founders, of Lincoln, who had served with the company for 53 years £15,085

BUTLER HENDERSON, MAJOR LIONEL, formerly a director of Parson & Crosland, Limited, iron and steel merchants, etc., of London, E.C.2, and the Linley Engineering Company, Limited £62,125

WARREN, SIR HENRY W. H., former managing director of Associated Electrical Industries, Limited, and a director of Metropolitan-Vickers Electrical Company, Limited, and other companies ... £2,518

EDWARDS, EBENEZER (EBBY), former president, and for 14 years general secretary of the Miners' Federation of Great Britain (later the National Union of Mineworkers), and for seven years National Coal Board member for labour relations £5,604

Coal Chartering

THE Hampton Roads coal market is quieter, and, even to Japan, charterers show no particular interest. Certainly, at the present moment, the market is inclined in charterers' favour, and may continue so unless demand to all areas shows a definite improvement. For January loading a 20,000-tonner has been taken from the Roads to Japan at $8.55, and 26,000 tons for February 19/March 25 to Tokyo Bay Tobata Range at five cents less, both with six days shinc. Charterers are endeavouring to improve on these figures.

So far as South America is concerned, two vessels have been taken from Brazil, 9,500 tonner for January 1/10 at $6.75, and 18,000-tonner for December 17/27 at $6.40, both with 60 cents discharge, and 11,000-tonner to Buenos Aires for January 1/15 at $6. Demand to the Brazils appears to be slight. Roads/West Italy has arranged a 16,000-tonner for December at $4.30 with 3,000 tons free with some interest maintained, following the fixture of a 15,500-tonner to Genoa or Savona at $4.40 for December 18 loading.

Further tonnage of 18,000 tons has been fixed to Antwerp, Rotterdam, or Amsterdam for December at the lower rate of 29s. 6d. and 13,000 tons to Emden-Weser for December 10/30 at 31s. 3d. Charterers could probably take further vessels. Miscellaneous fixtures include Port Moody or Seattle to Kawasaki, Tokyo or Wakamatsu, 10,000-tonner with anthracite at $6 for late December loading and Newcastle, (NSW) to Nagoya 9,500 tons coal at 43s. f.i.o. and trimmed for December 20/January 5.

Social Effects of Fife Pit Closures

SERIOUS problems affecting housing, education, and expansion of social services will be created by the early closing of collieries in the Cowdenbeath district previously forecast to have long lives, it was stated recently, in a report to Fife Planning Committee. The report, based on information by the National Coal Board, said that in the central area of Fife the coalfield around Cowdenbeath was approaching the end of its life. Since 1956 there had been a reduction of 23 per cent.—2,140 persons—in the number employed in the industry.

Fife County Council has based its programme of social services on those parts of the county where mining was said to have a flourishing future. It now appears that operations at most of the pits would terminate soon. The accelerated run-down of pits would create greater unemployment and more people would leave the county.

Yorkshire Pit Mechanics and Electricians May Strike

MECHANICS and electricians in Yorkshire pits have threatened to stage a protest strike in the New Year in support of their demands for higher pay. They aim to achieve a wage in the region of £3 10s. a shift—the average for a coal-face worker—compared with their present wage of just over £2 a shift.

Following a meeting at Barnsley on Saturday, a spokesman said that it had been decided to form associations of mechanics and electricians in the eight Areas in the North-Eastern Division of the NCB. There was no intention of breaking away from the NUM—"We just want to establish power groups to put forward our ideas," he said.

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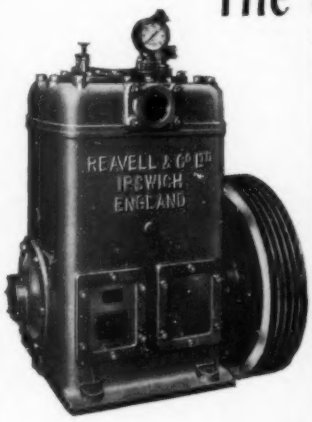

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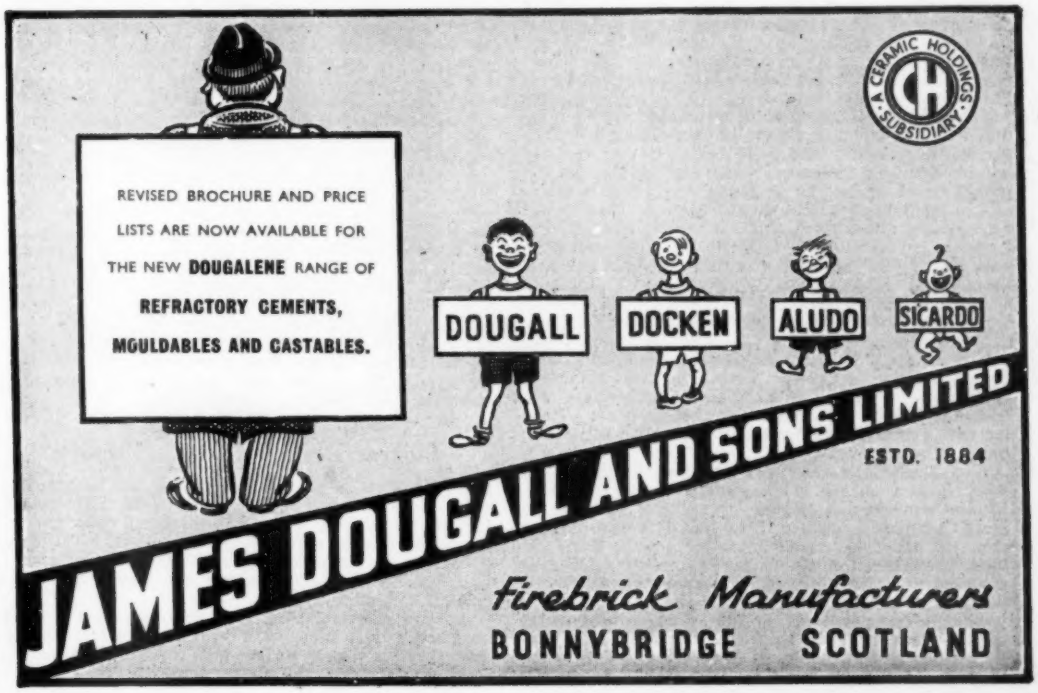


NEWS IN BRIEF

AS A FIRST STEP in its aim for a guaranteed annual wage, the West German miners' union is pressing for an undertaking from the collieries to pay a full day's work even when miners are told not to report in order to adjust output to falling demand.

TWO MORE Nottinghamshire pits, Linby and Calverton, have achieved an output of 1,000,000 tons. It is the first time that Linby, sunk in the 1860s, or Calverton, completed after the war, have reached 1,000,000 tons.

A SPOKESMAN FOR the Morgan Crucible Company, Limited, has officially denied that his firm has made any take-over bid for Ceramic Holdings, Limited, manufacturers of heat-resisting firebricks, etc., of Stirling.

BECAUSE of a shortage of ship repair work, about 250 men in the iron trades were paid off last week-end at the Swan, Hunter, & Wigham Richardson, Limited, dry docks department at Wallsend (Northumberland).

TWO NEWCASTLE-UPON-TYNE firms, A. Elliott (Electro-platers), Limited, and C. A. Parsons & Company, Limited, engineers and turbine manufacturers, have won the Industrial Safety Award of the British Safety Council. In the whole of Britain only 20 firms qualified.

MONETARY AWARDS, ranging in value from £125 to £65, have been presented to six employees at the Cwmbran (Mon) factory of Girlings, Limited, by Lt.-Col. W. H. Bush, director and general factory manager, for outstanding production suggestions during 1961.

NEED FOR senior executives to have a working knowledge of one or more foreign languages has led the Liverpool district of the Federation of British Industries, working in collaboration with the Liverpool Chamber of Commerce to plan courses in European languages.

TWO LARGE GIRDERS, too big to be carried by land—they were 100 ft. long and weighed 100 tons—have arrived at Newport (Mon), docks after being brought by coaster from Scotland. The girders are for the new Spencer steelworks of Richard Thomas & Baldwins, Limited, at Llanwern (Mon).

CANADIAN SUBSIDIARY of G. & J. Weir (Holdings), Limited, engineers and founders, of Glasgow, Peacock Bros., Limited, has agreed to sell its Nordstrom valve plant in La Salle, Quebec, to the Rockwell Manufacturing Company of Canada, a subsidiary of the Rockwell Manufacturing Company, of Pittsburg.

NEW WORKS now being completed at Rubery, Birmingham, for Uddeholm, Limited, steel manufacturers and stockholders, Crown Works, Northwood Street, Birmingham 3, will also include an office block and will form the British headquarters of the company. When the new building is completed, it is planned to sell the present Crown Works.

ANOTHER RECORD has been set up by the "Q" Ajax furnace in the melting shop of the Appleby-Frodingham Steel Company, branch of the United Steel Companies, Limited, Scunthorpe (Lincs). During the week ended December 2, the ingot make was 4,566 tons, beating the previous best figure of 4,536 tons achieved in the week ended November 11.

DEMANDS OF 3,000,000 manual workers for higher wages and shorter hours were rejected on Wednesday of last week by the Engineering Employers' Federation, whose director, Mr. B. Macarty, told representatives of 40 unions that they appeared to be "quite insatiable." He prophesied that there would be unemployment unless engineering became "more competitive oversea."

NON-CONTRIBUTORY pension scheme for the firm's 1,600 works employees, is being introduced on December 31, by Bairds & Scottish Steel, Limited, iron and steel manufacturers, of Glasgow. On retirement each full-time worker will receive a pension at the rate of 9d. a week for every year of service. Life insurance and total disablement benefit up to a maximum of £500 is also provided. The works pension will be in addition to those provided by the State.

ANNUAL PRIZES awarded by Griffin & George, Limited, manufacturers of scientific apparatus, and laboratory furnishers, of Wembley (Middx), for science teaching in primary and secondary schools, have been won by:—Mr. A. H. Johnstone, Edinburgh, Mr. F. G. Ford, Ellesmere Port (Ches), Mr. R. J. Roby, Reading (Berks), Mr. H. S. McCallum, Ayr, and Miss J. M. Norcliffe, Sheffield (Yorks). The awards, worth over 100 guineas, will be made again next year.

PRODUCTION PLANT for tantalum and niobium sheet and foil and tantalum anodes is to be built in Holland in a 50-50 joint venture by N.V. Billiton Miji, the Dutch tin concern, and the US Kawecki Chemical Company, of New York and Boyerstown, Pennsylvania. A joint subsidiary is to be set up under Dutch law, and work on the plant is expected to begin early in the New Year. It should be completed early in 1963. The new subsidiary will also act as agents outside the US for Kawecki's other products.

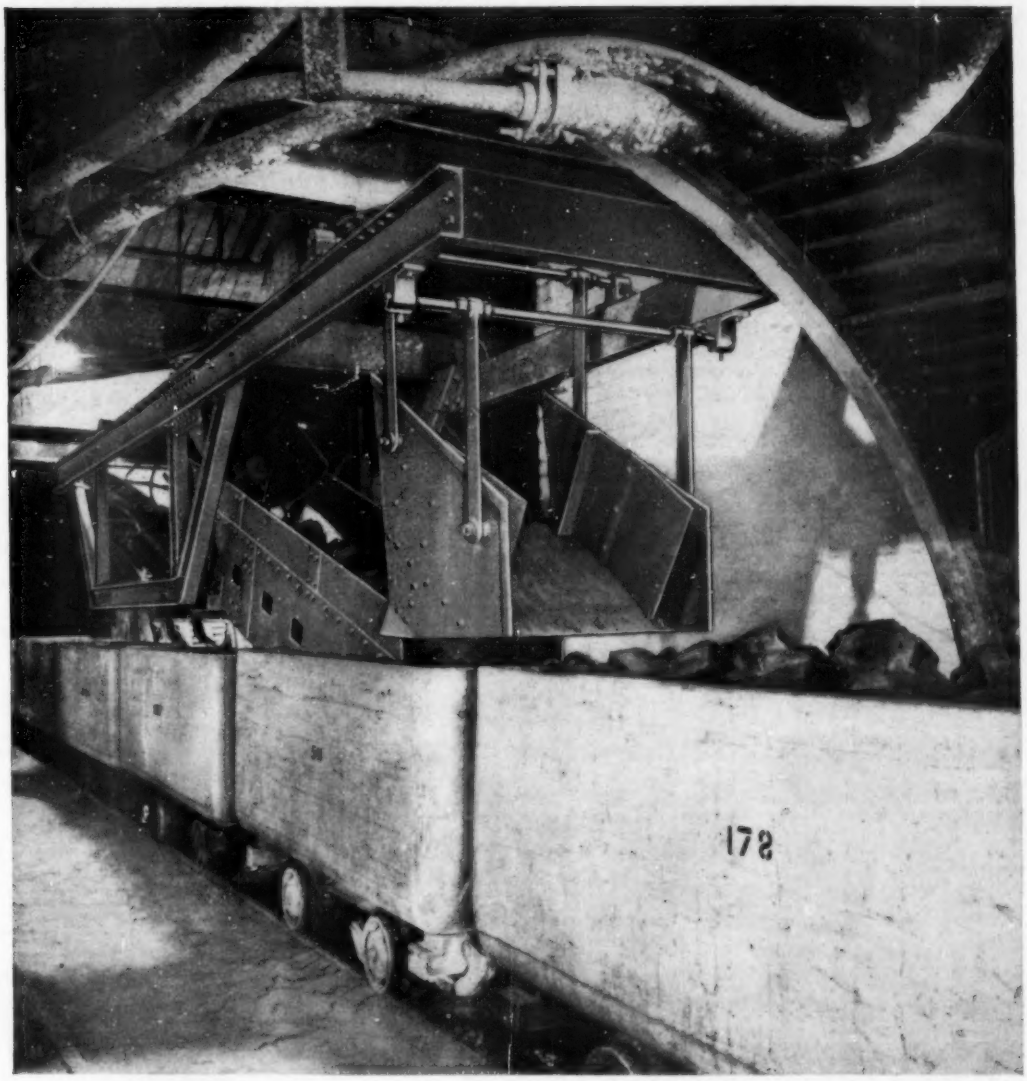
SHARP EXPANSION of orders to British shipyards, from home and abroad, in recent months is expected by the end of the year to bring the total volume of new business to about 800,000 gross tons, nearly 30 per cent. more than in 1960. With the industry's annual output still about 1,300,000 tons, this year will again show a drop in the order-book from the end-1960 level of 3,300,000 tons, but the receipt of large orders in the final three months of this year will probably maintain the third quarter level of around 2,750,000 tons.

MACHINE-TOOL manufacturing interests of the Thos. W. Ward, Limited, group (represented by Woodhouse & Mitchell, Limited, Brighouse) and Fredk. Town & Sons, Limited, Halifax, are to be merged under the name of Town Woodhouse, Limited, as from December 31. The directors are Mr. H. Vernon (chairman), Mr. G. S. Wood, Mr. A. Kissack, Mr. E. Town, and Mr. L. Forbes, with Mr. J. Taylor secretary. Mr. Town will be responsible for commercial management and Mr. Forbes for works management and technical development.

Edibrac Building Fourth Factory

WITH existing Cheshire factories at Broadheath, Romiley, and Stockport, Edibrac (Holdings), Limited, is building a fourth works at Bredbury, near Stockport, which will open next summer. The firm manufactures tungsten carbide products, machine cutting tools, underground mining machinery, and agricultural implements.

A similar programme, with the accent on general engineering and fabrication work, is planned for the new Bredbury unit, which will cover 50,000 sq. ft. The premises will include a research department.



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Advertisements accompanied by a remittance and replies to Box Numbers should be addressed to the Advertisement Manager, Iron and Coal, John Adam House, 17/19, John Adam Street, London, W.C.2. If received by first post Tuesday, they can normally be accommodated in the next Friday's issue.

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JUNIOR MINE SURVEYOR. Required for large Gypsum Mines. Young man age 18/20 years with about three years' experience and educated to about O.N.C. Level. Successful applicant will be required to continue studying on a part-time day basis to H.N.C. and eventual qualification to statutory Certificate. Candidate should apply stating age, educational standard reached, etc., to: MINE SURVEYOR, THE GYPSUM MINES LTD., Mountfield, Robertsbridge, Sussex.

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The applicant should be able to satisfy the following conditions:—

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Salary according to experience, plus travelling expenses.

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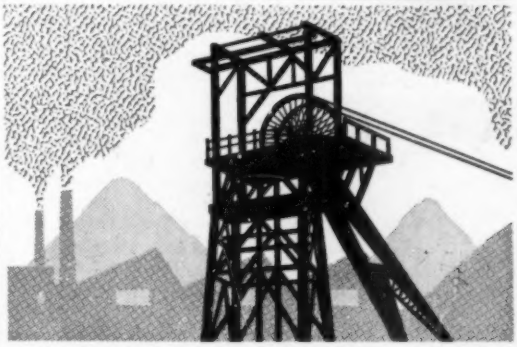

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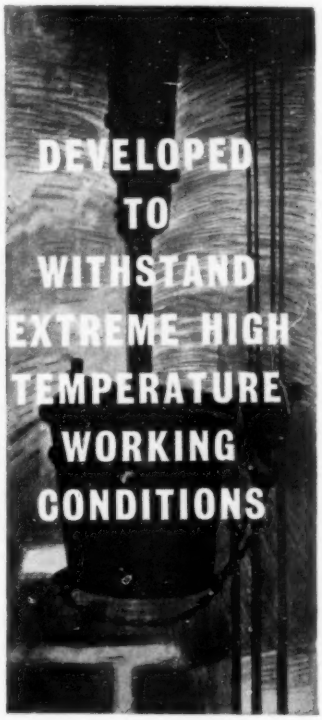

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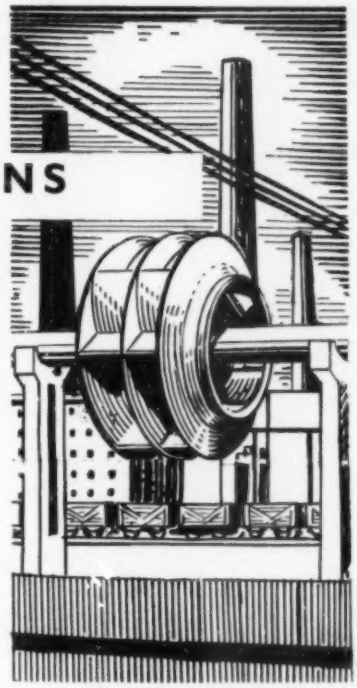

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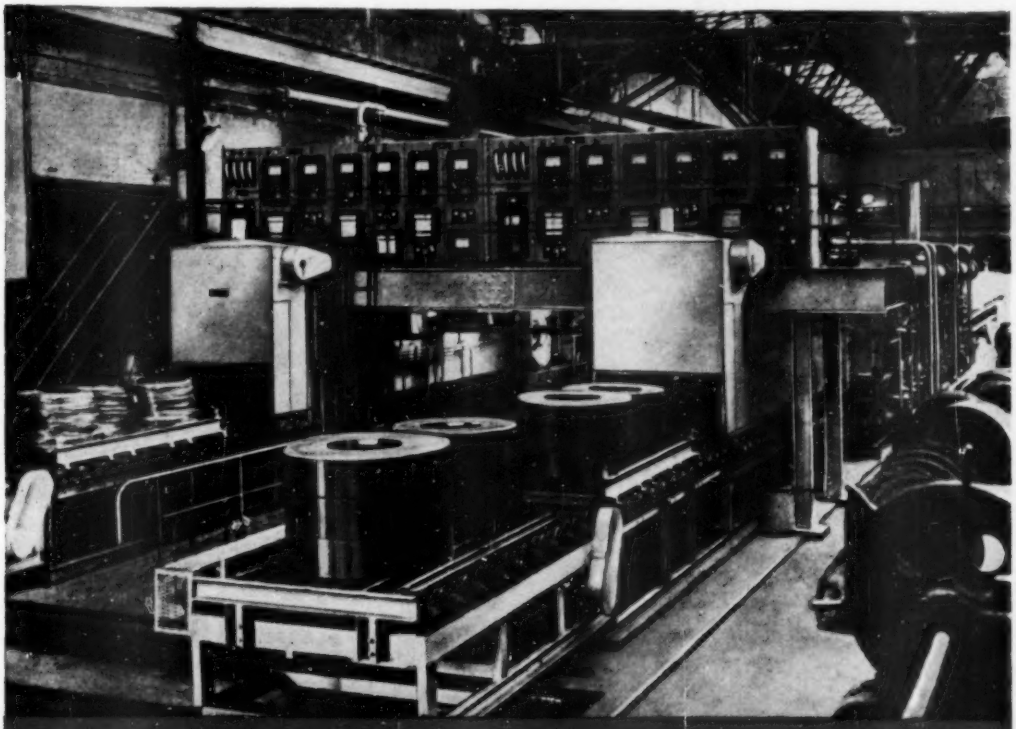

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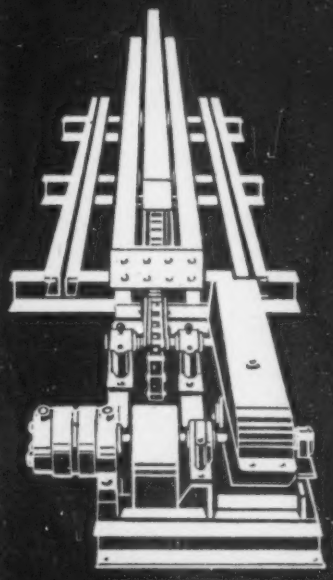
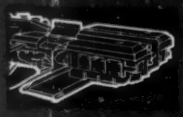
From face to surface

Sutcliffe serves mining

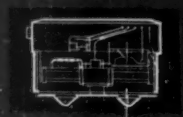


Tub and minecar handling equipment

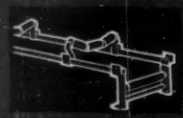


Face mechanisation

Drilling equipment



Water infusion



Modern conveying methods

Surface handling schemes

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